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A writer in *Science* directs attention to the preface of a new book by an Italian mathematician in which the author points out the opportunity of those whose age and strength do not permit them to offer arms to their country to "work for its scientific emancipation." This presents a thought which is perhaps worth considering, and specifically in connection with experiment station activities, where the question of duty contends in the breast of a large body of the workers.

None of these workers probably questions the ultimate value to his country of the studies he is conducting in the station, but continuance of it may not have occurred to him as representing a form of patriotic service in helping to place his country on a high plane of scientific freedom and influence. The fact that such service is not given as wide public recognition at the moment matters little if the correct viewpoint is maintained, for its vital importance and its real ultimate significance will be understood. It may take more courage to continue than to give up, but not more faith and confidence in the outcome if the worker is right minded.

The war has made us see many matters in a new light, and especially as bearing on the relations of nations. The world strength and influence of a nation is not measured alone by its wealth and commercial resources and force of arms. Its position in science as an original source of knowledge and a leader of thought and progress is an element of no small importance in giving it authority and commanding respect. Conspicuous activity in science not only advances a nation internally as a direct result of its accomplishment and its broad influences, but it is one of the important elements in determining the rank of a country among nations and respect for its views. It is one of the elements that make for preeminence.

A nation which can control the principal avenues of scientific communication between nations and continue to supply the leading handbooks and treatises through a long period has at its disposal an unusual opportunity for presenting its views, securing prominence for them, and thus exercising a profound influence on current science and theory throughout the world. Such position gives it a kind of power

which is more looked up to and acknowledged in time of peace than its potential force of arms. This we have well seen.

A contest for supremacy does not stop with such boundaries as territory, trade, and allegiance. It recognizes the advantage of influence and leadership, as well as of absolute authority. It naturally seeks to retain that advantage, to dominate world knowledge, to be regarded as the Nestor of science, to propagate the view of its pre-eminence in that field and of the authority of its outgivings.

To gain a commanding authority in science is not less to be sought than power in other directions, and it is quite as potent as a means of elevation. This is clear from the recognized dependence upon science of progress in industry and human welfare. A people who can dominate research and scientific thought can in large measure influence human development, industrial and intellectual. They become masters in a large sense, with power to exercise a control through the forces of influence, competition, priority, and leadership.

Authority secured through preeminence in science implies a dependence and inferiority or backwardness of those brought under it which inevitably restricts national development and independence of thought. This is true without the exercise of any oppressive or restraining measures. No progressive country can long forge ahead in its development and keep pace with the nations of the earth if it depends on borrowed or transplanted science. It must itself be an active and effective contributor, for it has its own special problems which it can not wait upon other countries to solve. It must develop competent specialists and experts capable of acquiring as well as of adapting and interpreting.

This is peculiarly the case in agricultural matters. Not only the proper applications of world knowledge need to be determined by careful study with reference to the local situation, but fundamental inquiries must be fostered which reach out into the unknown, or progress will be held back. Much of the task of scientific development in agriculture depends upon activity of this nature. No country can afford to be dependent upon another for it. If it is, it will necessarily lag behind and it is likely to make many costly mistakes.

It is recognized, of course, that science is not restricted by any national boundaries. It is world-wide, free, and its acceptance and incorporation into the knowledge of a nation is restricted only by the avenues of communication and the attitude of its people. But the provision for scientific investigation and publication should be a national one, since it is a matter of national interest and life and growth. Second-hand science is tardy, and does not take the place of original work. It develops neither the spirit nor the forces for

investigation. These are national assets and largely of a nation's making. The pursuit of research lends a certain element of zealous competition and pride in the scientific advance of one's own country.

The power of knowledge has been given remarkable demonstration by Germany. Her science in agriculture has alone enabled her to wage four years of warfare cut off from the rest of the world as effectively as possible. All of the principal countries opposed to her have acknowledged her superiority in acquiring and incorporating in practice information based on research, which has made her agriculture in many respects the best example of scientific agriculture in any country. The influence of her teachings and her example has been unparalleled.

In this country we have frankly acknowledged in the past that much of our agricultural science was borrowed from other branches and other countries, notably Germany. For a long time German-made science and German-made theories relating to the principles of agriculture and their practical application dominated all others. They gradually assumed a degree of authority which it has been difficult to overthrow even when our own work has shown them not to be applicable. The extent of the activity and the leadership of the country in this field, and the authority with which they were set forth, led contributions and theories which emanated from its workers to be readily accepted and regarded as representing the last word.

The situation was further emphasized by the fact that the results of this outstanding activity in research and discussion were reported in the standard journals of that country, which were frequently the leading journals of science in the world. German scientific literature was long the most important means of communication, and maintained its supremacy in spite of being in a difficult foreign tongue. It tended to make the German language the language of science. The theory and principles developed out of this investigation were promptly embodied in treatises and handbooks which by reason of the painstaking care in their preparation and frequent revision have remained standard for a long period, and even in their translation have retained the influence of their origin.

These circumstances, together with the historical development of agricultural science and the striking examples of its application, operated to give German science a preeminence in agricultural theory and practice. For a long time at least it dominated opinion, and investigators were slow to controvert it or to secure the acceptance of diverse opinions. Witness the tenacity with which Wolff's feeding standards persisted, even though they were based on infinitely less data than were represented by the many tests of them. The question of nitrogen assimilation from the air was a hotly disputed point, despite the experiments of Lawes and Gilbert in England,

Atwater in this country, and others, until Hellriegel reported his important findings which were stamped as classic and accepted the world over. In all research the deriving of conclusive evidence is of prime importance, but the courage and force of the investigator's convictions and confidence of his audience are only secondary.

Despite the great influence German methods and results have rightfully had on our own agricultural investigation and deductions, it is important that we should not subordinate our activities or be tied to theories and impressions of the past. While it is difficult to shake off the influence of German science upon our work and theories and upon the public mind, and this is only important as far as it impairs our scientific freedom, the solution of many of our peculiar problems requires a measure of independence and self-confidence which are now warranted.

Results and conclusions need to be assessed at their real value and significance as judged by the light of our own standards and conditions, irrespective of the source. With a disposition to accept without prejudice the results of applications of investigation which fit our conditions, it is important to exercise independence of thought and criticism, and to develop a measure of self-reliance commensurate with our own opportunities and vast needs.

The scientific activity of this country in matters relating to agriculture has grown tremendously in the past 20 years. It may be well for us to recognize frankly that in a considerable number of lines more work of an original and epoch-making character is being done here than in any other country, and that this places us in a position where we need not be dependent on others for the method and the fundamentals if we exercise the full measure of our opportunity. In a number of conspicuous lines workers in this country are doing as high grade of investigation and on as large a scale as in any part of the world; and in some lines it is probably not too much to say that they are in the lead. This a reason for confidence and an indication that it should not be necessary to wait upon other countries to do the pioneer work for us in research or application.

A great deal of American research has now gone beyond the views current abroad and has entered the field of original inquiry. Some of it is at variance with teachings we have accepted in the past. This is no stricture, for we need theories and hypotheses as means of advancing knowledge from point to point, and some of these will inevitably be relegated to the rubbish heap; but the danger lies in following somewhat blindly from force of habit, and accepting deductions and applications made under a quite different set of conditions. Interpretation is no less important than acquiring the fundamental facts. Because agricultural science is a composite science, and largely

an applied one, research and especially interpretation and generalization in it need to be made with great care and with full understanding of prevailing conditions.

Not all of our borrowed or transplanted science has been found to apply. Theories and conclusions in which great confidence was placed because of their source have been woven into the fabric of our theory and principles and urged in practice only to be found later not wholly applicable under American conditions. Modifications have proved to be necessary, sometimes even extending to the basic principles. This is doubtless partly our own fault, but it indicates the danger of accepting and applying unquestioningly work from another source and holding to it tenaciously after our own experience has cast doubt upon it.

Illustrations of lines in which American workers are conspicuous and are in some instances in the ascendancy are found in such subjects as the study of the principles of breeding, the chemistry of the various constituents of foods and feeding stuffs and their special nutritive relations, the study of diseases of plants and effective means of combating them, the control of insect pests based on life history studies and the theory of the action of sprays and other remedies, the functions and relations of water and fertilizers in plant growth, etc. In these and many other lines the force and the facilities have been developed, and in large measure the support which makes their continued pursuit possible with public funds.

If therefore in some of these matters a point has happily been reached where we can more largely stand alone, and where our investigators have become leaders and not followers, there is the more reason why this position should be maintained and extended. There is no reason why we should be dominated or overshadowed by the knowledge and science of another people. The intellectual independence and the development needs demand that we shall be scientifically fit and maintain our research in the front rank.

We recognize the international character and spirit of science. It is a neutral subject. We accept the new contribution on the basis of its actual merit as nearly as it may be assessed, without respect to its source. But it is well to remember that there is no hierarchy in science, no single source or group to which it is committed or to which we are to look for it. Theory and discovery are not necessarily worthy of more weight because they come from a source which has been our most conspicuous supply in years gone.

In the new world which will exist after the war the United States, as a member of a fraternity of nations, ought to contribute to the advancement of human knowledge in proportion to its population and wealth. The object will not be to gain knowledge for the purpose

of dominating the rest of the world but for the sake of making our proper contribution to human welfare. We are fortunate in having established a great system of agricultural research on a public foundation and largely connected with institutions for higher education, thus keeping it apart from political and commercial influences.

We have come to realize already some of the advantages to this country of its present position in agricultural investigation, and of means of dissemination provided by treatises and periodicals in our own tongue. It is quite possible that after the war scientific journals and handbooks in the English language, if maintained at sufficient grade to merit it, will find a wider market and a wider field of influence. We are now able to see that the advantage of preeminence in a line of science lies not alone in its benefit to the industry for which it is primarily developed, but in the prestige it may carry among men of science and in the family of nations.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Fruit juices, F. THOMPSON (*Delaware Sta. Bul.* 119 (1918), pp. 18, 19).—In the course of investigations on fruit juices an attempt was made to determine citric, malic, and tartaric acids by the effect on the rotatory power produced by uranium acetate or molybdic acid. Good results were obtained with pure solutions of the acids, but concordant results could not be obtained with natural fruit juices, owing probably to the influence on rotation of other substances in the fruit juice and to the fact that molybdic acid was reduced. Good results were obtained by Willman's modification of the Pratt method for the determination of citric acid, previously noted (E. S. R., 36, p. 317). Preliminary studies of the hydrogen-ion concentrations of the fruit juices at different stages of maturity gave surprisingly constant results, a fact which is considered an indication of the constant acidity that is probably maintained for the purpose of enzyme activity.

The occurrence and significance of mannitol in silage, A. W. DOX and G. P. PLAISANCE (*Iowa Sta. Research Bul.* 42 (1917), pp. 353-367).—Previously noted from another source (E. S. R., 37, p. 801).

The fruit of the *Asparagus officinalis*, N. E. HENNER (*Chem. News*, 116 (1917), No. 3630, pp. 296, 297; *abs. in Analyst*, 43 (1918), No. 593, p. 69; *Chem. Abs.* 12 (1918), No. 8, p. 817).—The following analytical data are reported: Percentage of sugar, 36.12; ash, 3.5; oil, 1.08; and protein, 1.56. The oil obtained was a semisolid mass having a specific gravity of 0.9605 and a saponification number of 178.57. A large amount of malic acid and a trace of citric acid were found. The percentage of ash constituents was as follows: SiO_2 , 2.53; Al_2O_3 , 0.98; Fe_2O_3 , 2.53; CaO , 3.52; MgO , 6.09; K_2O , 5.35; Na_2O , 8.73; and SO_3 , 7.91.

The analytical examination of the sweet chestnut (*Castanea sativa*), J. L. BAKER and H. F. E. HULTON (*Analyst*, 43 (1918), No. 592, pp. 32, 33).—The authors report the following analysis of the sweet chestnut: Moisture, 4.7 per cent; ash, 2.68; ether extract, 2.9; proteins ($\text{N} \times 6.25$), 7.44; reducing sugars as dextrose, 5.36; cane sugar, 9; starch (Linnier), 50.6; starch (taka-diastase), 4.98; pentosans, 3.06; crude fiber, 2.28; and matter soluble in cold water, 22.08 per cent. Unlike the horse chestnut (E. S. R., 38, p. 410), there was but little evidence of diastatic activity.

Chemical tests of Manchurian soy beans, A. A. WILLIAMSON (*U. S. Dept. Com., Com. Rpts.*, No. 101 (1918), pp. 466, 497).—Chemical analyses of Manchurian soy beans and soy-bean cake are reported. The average oil content of standard beans has been as follows: 1912, 18.15 per cent; 1913, 18.22; 1914, 17; 1915, 17.25; and 1916, 16.94 per cent.

The study of copra and other coconut products, A. J. COX (*Philippine Jour. Sci., Sect. A*, 12 (1917), No. 2, pp. 49-53).—The author reviews briefly the work that has been done by the Bureau of Science at Manila on the coconut and its

products. A bibliography of investigations conducted and published by the bureau on this subject is included.

Copra and coconut oil, H. C. BRILL, H. O. PARKER, and H. S. YATES (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 2, pp. 55-86*).—This paper presents analytical and botanical data relative to losses in copra and oil due to the faulty production of copra and suggests means for improvement. The data show that unless the coconut meat is dried immediately after opening the nuts to a moisture content of approximately 6 per cent, it is attacked by various microorganisms which cause a loss in oil content, the extent of which depends upon the length of time the meat retains sufficient moisture for mold growth.

The four molds which constantly occur upon moldy copra and coconut meat are, in the order of the moisture content necessary for their growth, *Rhizopus* sp., or white mold; *Aspergillus niger*, or black mold; *A. flavus*, or brown mold; and *Penicillium glaucum*, or green mold. The moisture content necessary for the growth of these molds on copra and the resulting loss in oil are reported. A loss of from 30 to 40 per cent of oil may be expected in all copra which contains sufficient water (7 to 8 per cent) to enable brown mold to grow. When poorly dried copra is stored there is a marked rise in temperature and increase in carbon dioxide content of the atmosphere surrounding the copra, showing oxidation and consequent loss of oil.

The copra drying methods in use in the Philippines are described and a method involving the use of sulphur dioxide is suggested.

Methods for the production of pure coconut oil, H. O. PARKER and H. C. BRILL (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 2, pp. 87-94*).—The authors discuss the native methods of obtaining oil from fresh coconuts and describe improved methods which have been successful in laboratory practice.

In one method the meat is freed from the shell, ground fine, and subjected to the action of live steam for three hours in a cooking vat in which the material is violently agitated. The emulsion is strained off, the pulp pressed, and the combined liquids kept at a temperature of 15° C. for three hours. The oil separates from the water and solidifies. After being warmed to atmospheric temperature it is run through a filter press, then sterilized at 100° for 30 minutes, and stored in air-tight containers. Oil prepared thus is free from acidity and rancidity and has good keeping qualities.

The second method is a continuous process in which the meat is removed from the shell, dried to a moisture content of 10 per cent, and, while still hot, subjected to pressure for the removal of the oil. The press cake from the above method is white and clean and offers possibilities not only as a stock feed but for human consumption. It has the following composition: Water, 7.35 per cent; oil, 32.14; ash, 4.05; crude fiber, 37.12; and protein (N×6.25), 20.34.

Recipes for the preparation of food products from the meal are included.

The rancidity of Philippine coconut oil, H. C. BRILL and H. O. PARKER (*Philippine Jour. Sci., Sect. A, 12 (1917), No. 2, pp. 95-110 abs. in Analyst, 43 (1918), No. 504, pp. 89, 90*).—This article discusses the various methods in use for measuring rancidity and presents analytical data leading to the following conclusions:

"The color tests with decolorized fuchsin and with diazobenzene sulphonic acid are not reliable tests for rancidity. High acidity of oils is not coterminous with rancidity. Steam distillation removes rancidity, but makes very slight changes in the acidity; neutralization with alkali and washing removes the acidity but not the rancidity. The Reichert Meissl number in the few cases

studied indicated no close relationship between this constant and the rancidity. No conclusions could be drawn from the magnitude of the iodine value. The soluble fatty acids show a relationship which indicates that this constant might be of value in an estimation of the rancidity of an oil. The acetyl value may be of value in indicating rancidity, but is not a measure of the degree of rancidity. The oxidizability number appears to be a good confirmatory test for rancidity, but a few samples of oils undoubtedly rancid gave low oxidizability values. However, where the value was high, the oil was always rancid."

Oxidation numbers of medicinal fats. G. ISSOGLIO (*Ann. Chim. Appl. [Rome]*, 7 (1917), No. 9-12, pp. 187-199; *abs. in Chem. Abs.*, 11 (1917), No. 18, pp. 2598, 2599).—The oxidation numbers (E. S. R., 37, p. 114) have been determined for medicinal fats of three classes, namely, glycerids of vegetable origin, such as olive, almond, and castor oils, and cacao butter; glycerids of animal origin, such as lard, mutton tallow, and cod-liver oil; and galenical preparations, including ointments and pomades. The following values of this constant are reported: Pure olive oil, 2.85 to 3.18; almond oil, 1.18 to 3.15; castor oil, 0.85 to 3.18; cacao butter, 3.81 to 4.93; purified lard, 0.58 to 1.12; purified beef fat, 3.25; fresh mutton fat, 6.48; rancid mutton fat, 25.26; benzoinated lard, 4.62; colorless cod-liver oil, 1.84 to 8.07; and reddish cod-liver oil, 20.4 to 38.42.

The author recommends that reddish cod-liver oil should not be used as a medicinal oil, as the color is almost always accompanied by a high oxidation number. The oxidation number should be included with the acidity number in the Italian Official Pharmacopœia to indicate the good keeping qualities of medicinal oils. The oxidation number for medicinal fats and for benzoinated lards should not exceed 10. A high oxidation number for mercurial pomades should be taken to denote a preparation obtained from rancid fats or, if the number be very great, the presence of turpentine.

Oil from rice polishings, F. GABELLI (*Ann. Chim. Appl. [Rome]*, 8 (1917), No. 9-12, pp. 109-114; *abs. in Jour. Soc. Chem. Indus.*, 37 (1918), No. 7, p. 137 A).—The practicability is discussed of extracting oil from rice polishings and of utilizing the oil for the production of soap, fatty acids, and glycerin and the press cake as a feeding stuff. Analyses are given of the oil obtained by extraction with petroleum ether and by pressing, of the rice polishings, and of the press cake. The cake is deemed superior to the original polishings for feeding purposes as it is more compact and consequently easier to transport, and contains less fat, which readily becomes rancid. With the commercial utilization of the oil its value as a by-product would be increased.

Study of foreign oils in castor oil employed (as a lubricant) in aviation motors, C. FRABOT (*Ann. Chim. Analyt.*, 22 (1917), No. 11, pp. 217-223; *abs. in Analyst*, 43 (1918), No. 502, pp. 40, 41; *Ann. Falsif.*, 11 (1918), No. 111-112, pp. 50-52).—Analytical data are reported of the principal constants of mixtures of castor oil and peanut oil of known proportions. The data show that of the usual constants the acetyl number alone has a low enough limit of sensibility (1 or 2 parts in 100) to be of value in detecting peanut oil in amounts less than 5 parts in 100.

Two methods are suggested for determining the amount of peanut oil in an adulterated castor oil. One depends upon the fact that an alcoholic solution of pure castor oil remains clear on cooling to -20°C ., while the addition of peanut oil causes turbidity at different temperatures corresponding to the amount of oil added; 1 per cent at -4 to -5° , 2 per cent at -2 to -3° , 3 per cent at 0° , 4 per cent at 3° , and 5 per cent at 5 or 6° . The second method consists in extracting the adulterant with petroleum ether, in which castor oil is relatively insoluble. Amounts of peanut oil of less than 1 per cent can be detected

in this way. The castor oil dissolves a small amount of the petroleum ether the increase in volume being proportional to the purity of the oil.

Study of foreign oils in castor oil employed as a lubricant in aviation motors. C. FRABOT (*Ann. Chim. Analyt.*, 23 (1918), No. 1, pp. 7-11).—Variations in the results obtained for the solubility of castor oil in petroleum ether by the method noted above led to a study of the solvent power of fractions of the petroleum ether of varying boiling points and density. It was found that the solubility of castor oil in petroleum ether increases with the density of the solvent, while the solubility of the ether in the castor oil varies very little with the density. The author suggests that in using this method for detecting peanut oil in castor oil the petroleum ether should be freshly distilled and the fraction used which is obtained between 35 and 65° C.

The "Valenta number" as a discriminating test for oils and fats. P. J. FAYEN and F. E. WESTON (*Analyst*, 43 (1918), No. 502, pp. 3-20, figs. 5).—The authors report a critical study of the Valenta number undertaken for the purpose of discovering the causes of discrepancies in results and the extent to which they operate. The test as originally proposed differentiated between oils and fats according to their solubility in glacial acetic acid, the method being to ascertain the exact temperature at which the clear heated solution showed the faintest trace of turbidity on being cooled.

As a result of the investigations, which are reported in detail with analytic data, two methods are described which are considered to give reliable results. In one method acetic acid is used as a solvent and in the other amyl and ethyl alcohols. In both methods the values are adjusted by reference to almond oil used as a standard. Diagrams are given showing the Valenta number with each method.

The results indicate that the alcohol method separates the butter fat and coconut groups and the rape oil widely from the rest, but does not discriminate the drying oils from the nondrying oils as distinctly as does acetic acid. It is recommended for testing arachis, rape, and linseed oils where high iodine values are of advantage, and for differentiating between coconut and palm-kernel oils. The turbidity temperature is more distinct with alcohol than with acetic acid. The acetic acid test is said to be rapid and useful for testing arachis, rape, and, to a less extent, olive and perilla oils, as well as for testing butter fat.

The method of enzyme action. J. BEATTY (*London: J. & A. Churchill, 1917, pp. IX+143*).—In this monograph the author has summarized the chief results of modern research on enzymes and catalytic actions and has formulated an interesting hypothesis of ferment action based upon the power, common to all enzymes, of attracting H or OH groups in water and upon the power, specific to the ferment in question, of adsorbing some particular substance. He suggests that all enzymes must be composed of one substance exercising the specific and another the general function.

The book contains an introduction by E. H. Starling.

Studies in the nitrogen metabolism of bacteria. H. J. SEARS (*Chicago: American Medical Assoc., 1916, pp. 35, figs. 5*).—This is a study of the nitrogenous constituents of the food supply of bacteria and a chemical examination of the products of the action of bacteria upon these food substances. Data are given of the production of amino acid and ammonia by various organisms in peptone, in meat-extract peptone, and in gelatin with and without the addition of glucose to the medium. The possible formation by bacteria of urea, uric acid, allantoin, creatin, and creatinin was also studied. The general results were as follows:

Peptone cultures of most bacteria give fluctuating concentrations of amino acid, showing that these bodies are formed and broken down continuously by

the organisms. Exceptions to this rule are a few strongly proteolytic organisms, such as *Bacillus pyocyaneus*, *B. subtilis*, *Spirillum cholerae*, and *S. melchiorii*, the cultures of which show steadily increasing concentrations of amino acid. Most species, when grown in peptone or peptone gelatin media, appear to utilize the simpler compounds of nitrogen before attacking the protein or peptone, and also seem able to utilize ammonium salts in small amounts. The protein-sparing effect of glucose is shown by the concentrations of free ammonia and of amino acid. Practically the same amount of ammonia- and amino acid-production is shown by the organisms on peptone solutions containing 5 per cent gelatin as on pure peptone solution, except in the case of organisms having a gelatin-liquefying power. Evidence is given in most cases of the presence of large amounts of nitrogenous products intermediary between amino acid and ammonia.

Urea, uric acid, and allantoin could not be found. A few species of bacteria are capable of producing creatin and creatinin in sugar-free peptone cultures. Many more are capable of producing these substances in media containing glucose.

Fat-free lactose-free extract, C. PONCHEN and R. DAGE (*Ann. Falsif.*, 10 (1917), No. 107-108, pp. 458-470).—From numerical data submitted, the authors criticize the conclusions of Ackermann, previously noted (E. S. R., 36, p. 614), that the ratio between lactose-free solids and lactose is of value in judging milk. In the case of a milk suspected of coming from animals affected with mastitis, determinations should be made of lactose, total ash, sodium chlorid, total protein, and casein, and, if possible, microbiological and cytological examinations. Whenever, all adulteration having been excluded, chemical analysis shows that the composition of the milk examined is weak, search should be made for a more than probable pathological origin by studying the general and local health of the animal furnishing the milk.

The estimation of nonprotein nitrogen in blood, I. GREENWALD (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 97-101).—The various methods in use for the precipitation of protein in the estimation of nonprotein nitrogen in the blood are discussed.

Trichloroacetic acid in 5 per cent solution without the addition of kaolin, previously recommended (E. S. R., 37, p. 14), has been found to give satisfactory results and is considered by the author to be the most convenient precipitant to employ. The nitrogen is determined by distillation and titration, although the use of trichloroacetic acid may be combined with the direct nesslerization process of Folin and Denis (E. S. R., 36, p. 316).

A new method for the direct nesslerization of ammonia in urine, J. B. SUMNER (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 37-41).—The authors recommend the use of copper hydroxid as rapid and easy and offering special advantages for time saving over the permute method of Folin and Bell (E. S. R., 37, p. 311). The method is as follows:

Pipette into a large test tube exactly 10 cc. of copper sulphate solution containing 298 gm. of pure crystallized copper sulphate per liter, 15 cc. of urine, and 10 cc. of 2.03 N sodium hydroxid solution. Stopper immediately and shake vigorously to mix the materials thoroughly. Filter through an 11 cm. filter paper, covering the funnel with a watch-glass to prevent evaporation. Pipette into a 100 cc. volumetric flask the amount of filtrate that a preliminary test has shown to be advisable. Add 1 drop of a saturated solution of Rochelle salt to prevent precipitation of the trace of copper that is present. Dilute and nesslerize with 10 cc. of the Nessler solution of Folin and Denis. The preliminary test is made by nesslerizing a minute portion of the filtrate from the copper hydroxid and roughly comparing the color with a set of permanent

standards prepared from a solution of ferric chlorid and cobalt nitrate and standardized against definite amounts of nesslerized ammonia nitrogen.

Tables are given showing the values of the standardizing solution and indicating the accuracy of the results obtained by this method.

A method for the determination of sugar in normal urine, S. R. BENEDICT and E. OSTERBERG (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 195-201; *abs. in Jour. Amer. Med. Assoc.*, 70 (1918), No. 21, pp. 1567, 1568).—The method is an adaptation of the colorimetric procedure of Lewis and Benedict¹ for the determination of sugar in blood. The process consists of (1) the preliminary precipitation of interfering substances from the urine by excess of mercuric nitrate in the presence of a slight excess of sodium bicarbonate and subsequent removal of the mercury with zinc dust, and (2) the determination of the sugar in the filtrate, as follows:

The special reagents used are (1) mercuric nitrate solution, prepared by adding to 100 cc. of concentrated nitric acid 220 gm. of mercuric oxid, heating the mixture to boiling, and adding 60 cc. of 5 per cent sodium hydroxid solution; this is made up to 1 liter and filtered; (2) picrate-picric acid solution, prepared by adding to 500 cc. of 1 per cent sodium hydroxid solution 36 gm. of picric acid and 400 cc. of hot water. After the picric acid is dissolved the solution is cooled and diluted to 1 liter.

To 15 or 20 cc. of urine in a 500-cc. beaker is added an equal volume of the mercuric nitrate solution. Sodium bicarbonate is then added in small quantities until frothing ceases and the mixture reacts alkaline to litmus. After filtering through a dry filter paper a pinch of zinc dust and 1 or 2 drops of concentrated hydrochloric acid are added to the filtrate, which is again filtered. From 1 to 4 cc. of the final filtrate is measured into a test tube graduated to 12.5 and 25 cc., 1 cc. of 20 per cent (anhydrous) sodium carbonate solution and 4 cc. of the picrate-picric acid solution are added, and the tube plugged with cotton and placed in boiling water for 10 minutes. After cooling, the solution is made up to the 25-cc. mark or to 12.5 cc. If the amount of sugar present is very small, and the colored solution is matched in a colorimeter against a standard prepared by treating 1 mg. of glucose in 4 cc. of water as the final filtrate was treated or by a permanent standard of picramic acid solution or potassium dichromate. To determine the glucose or fermentable sugar in the sample of urine it is necessary to make a second determination on the sample after fermentation of the urine with yeast.

The method is considered to give figures which represent very nearly the true sugar content of normal urine. If applied to diabetic urines the samples must be diluted from 10 to 100 times before analyzing.

A modification of the Lewis-Benedict method for the determination of sugar in the blood, S. R. BENEDICT (*Jour. Biol. Chem.*, 34 (1918), No. 1, pp. 203-207).—The method involves the use of the picrate-picric acid solution and standards mentioned in the previous paper. The procedure is as follows:

Two cc. of blood is drawn into an Ostwald pipette containing a little powdered potassium oxalate, and discharged into a large test tube graduated at 12.5 and 25 cc. The pipette is washed with distilled water, the washings being added to the blood. The mixture is made up to the 25 cc. mark with the picrate-picric acid solution and filtered through a dry filter. Exactly 8 cc. of the filtrate is measured into another graduated test tube and 1 cc. of 20 per cent (anhydrous) sodium carbonate solution is added. The tube is plugged with cotton, immersed in boiling water for 10 minutes, and the determination finished as outlined in the previous paper. The glucose standard is made by treating 0.64 mg. of glucose in 4 cc. of water with 4 cc. of the picrate-picric acid

¹ *Jour. Biol. Chem.*, 20 (1915), No. 1, pp. 61-72.

solution and 1 cc. of the carbonate. This is heated for 10 minutes in boiling water and diluted to 12.5 cc.

Results obtained by this method duplicate very closely those obtained by the original Lewis-Benedict method. The necessity of further concentration is avoided by the use of the very strong solution of pheric acid. In the determination of the sugar content of pathological human blood it is suggested that it may be advisable to employ the preliminary precipitation of possible interfering substances by mercuric nitrate and sodium bicarbonate as described for urine in the previous paper.

Arsenical glucoses, A. KLING (*Ann. Falsif.*, 10 (1917), No. 107-108, pp. 438-439, figs. 4).—A comparison is reported of the methods most frequently employed for detecting arsenic in glucose for the purpose of determining the degree of exactness and sensibility of each method.

A rapid method for the selection of sulphuric acid for the manufacture of glucose, A. KLING (*Ann. Falsif.*, 10 (1917), No. 107-108, pp. 451-453, fig. 1).—An apparatus for the determination of arsenic in sulphuric acid by means of mercuric chlorid paper is described and illustrated diagrammatically.

Vegetable decolorizing carbons and their use in the cane sugar industry, P. W. ZERBAN (*Louisiana Stas. Bul.* 161 (1918), pp. 5-38, figs. 2).—This publication summarizes the important data on the subject, including the results of some laboratory and sugarhouse tests made at the Louisiana Sugar Station during the grinding season of 1917-18.

Laboratory experiments on the decolorizing effect of varying percentages of Norit on juices clarified by different methods show that the least colored juices are obtained and the greatest saving of Norit effected by clarifying with lime and phosphoric acid. The juices, however, do not settle as quickly as when treated with lime and sulphurous acid. If the latter reagents are used the addition of a small quantity of phosphoric acid with the Norit to the clarified juice will cause a great improvement in color.

Laboratory and factory experiments to determine the effect of rice carbon on juice clarified in different ways gave the following results: The color was more easily removed by the carbon from the unboiled juice than from the sirup or molasses. No measurable difference was noted in the viscosity of treated and untreated samples of the juice or sirup, although the treated sirups seemed to boil more freely than the untreated. There was a marked improvement in the purity of the sirups and juice, the extent depending on the method of clarification and amount of carbon employed. No inversion was caused by the carbon treatment nor was there any marked change in the quantity of free acids. The average total nitrogen content of the molasses from treated products was 3.9 per cent lower than that from the untreated. A small reduction in ash and gums was noted.

These results lead to the conclusion that a larger amount of high-grade sugar would be obtained by the use of decolorizing carbons than without them. The present data are deemed insufficient to determine whether it would be better to use the carbon directly on juices and sirups in the raw sugar factory or to make raw sugar first and then refine it by means of carbon. The advisability of using either of the two processes will be largely determined by the difference in price of dark and light molasses, which varies with different localities.

Contribution to the study of alcohols in cider, E. KAYSER (*Bul. Soc. Agr. France*, 1917, Nov., pp. 321-323).—This article reports data on the analytical constants of cider obtained under controlled laboratory conditions. It gives evidence that the presence of higher alcohols and ethers may be caused by secondary fermentation, and that under the same conditions fermentation does not always take place to the same extent.

Clarification of wines: Spontaneous and artificial, L. MOREAU and E. VINCE (*Rev. Vit.*, 47 (1917), No. 1222, pp. 341-345).—In this article are described various processes for clarifying wine, including clarification by milk, casein, egg white or egg albumin, fresh and powdered blood, gelatin, and fish glue, (isinglass). The last reagent is considered the most satisfactory by the authors and the method of its use is described in detail.

METEOROLOGY.

Nocturnal cooling of the lower layers of the air, H. PEBROTIN (*Compt. Rend. Acad. Sci. [Paris]*, 166 (1918), No. 15, pp. 616, 617; *abs. in Rev. Sci. [Paris]*, 56 (1918), No. 9, p. 283).—From a review of observations from various sources, the author concludes that the coefficient of radiation decreases decidedly with elevation and is reduced almost one-half at an altitude of 300 meters. He concludes that the decrease is not attributable to lowering of temperature with atmospheric pressure as indicated by the results of laboratory experiments.

The "old fashioned" winter of 1917-18, C. M. BROOKS (*Geogr. Rev.*, 1 (1918), No. 5, pp. 495-414).—The characteristics of this unusual winter are described and the causal sequence of events during the winter is explained. It is suggested that the unusual conditions "may have been caused by a sun hotter than usual which brought on self-perpetuating cold waves and droughts."

Climatological data, M. B. SUMMERS ET AL. (*Alaska Stas. Rpt.*, 1916, pp. 5, 91).—Tabular summaries are given of monthly and annual normal temperature and precipitation at 38 stations in Alaska for 19 years, a comparison of weather (temperature, rainfall, and clear days) at 12 stations during summer months of 1915 and 1916, and monthly summaries of observations on temperature, precipitation, and condition of the weather at 25 stations during 1916.

Meteorological observations, J. S. STEVENS (*Maine Sta. Bul.*, 268 (1917), pp. 315, 316).—A monthly and annual summary of observations at the University of Maine on temperature, precipitation, cloudiness, and wind movement during 1917 is given. The mean temperature for the year was 42.17° F. as compared with an average of 42.75° for 49 years; the total precipitation was 44.06 in., the snowfall 117.25 in., the number of clear days 216, the number of cloudy days 83, and the total movement of wind 51,414 miles.

[Meteorological observations], D. A. SEELEY (*Ann. Rpt. Sec. Bd. Agr. Mich.*, 56 (1917), pp. 189-204).—Daily and monthly summaries of temperature (maximum, minimum, and mean), precipitation, cloudiness, and sunshine, and monthly summaries of pressure (maximum, minimum, and mean), wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos) at East Lansing, Mich., are given for the year ended June 30, 1917.

Meteorology report, 1916, H. G. KNIGHT and W. L. HESS (*Wyoming Sta. Rpt.*, 1917, pp. 158-161).—Monthly summaries are given of observations at Laramie, Wyo., during 1916 on temperature, pressure, precipitation, humidity, sunshine, and wind movement. The highest temperature was 86° F., June 25 and July 3 and 5; the lowest, -25°, November 13. The total precipitation was 10.18 in. The highest relative humidity was 100 per cent, October 19 and December 10, 13, and 20; the lowest, 13 per cent, November 5. The greatest velocity of wind was 60 miles per hour, March 6. The first killing frost was October 8.

SOILS—FERTILIZERS.

Aluminum as a factor influencing the effect of acid soils on different crops, B. L. HARTWELL and F. R. PEMBER (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 1, pp. 43-47).—Further studies are briefly noted along lines of investigation in progress at the Rhode Island Experiment Station, and previously described

E. S. R., 20, p. 126; 32, p. 622), in an effort to determine the relative importance of aluminum and of free acid as factors influencing the plant growth in acid soils.

The addition of aluminum sulphate, equivalent to the amount of aluminum found in the extract of an acid soil, to a nutrient solution, depressed the growth of barley seedlings much more than that of rye seedlings, but the same amount of sulphuric acid unaccompanied by aluminum depressed the rye as much as the barley. Since the hydrolysis of the aluminum sulphate gave about one-fourth the hydrogen-ion concentration of that resulting from the free acid, aluminum was deemed to be the principal cause of the depression in the growth of the barley, and the conclusion was reached that the two seedlings were affected by the nutrient solution containing aluminum the same as they were by an aqueous extract of an acid soil.

A moist acid soil upon which most kinds of plants were unable to grow was kept in intimate contact for about two weeks with acid phosphate at the rate of 23 tons per acre, after which it was planted to lettuce. A maximum crop was secured, even more than where lime replaced the phosphate, and even though the plant could not exist on the unphosphated soil supplied only with nutrients. The soil acidity was found to have been greatly increased, but the solubility of the aluminum in dilute acetic and carbonic acids was markedly reduced by the phosphate. The authors found that after sufficient hydrated lime had been added to produce a maximum crop of lettuce a lime requirement equivalent to from 4,000 to 5,000 lbs. of calcium oxide per acre existed at the end of the experiment, in spite of the fact that nearly all the lime had entered into reaction with the soil.

It is concluded, therefore, that "determinations of the amount of what may be called active aluminum may prove to be as desirable as acidity determinations, and the lime requirements of a soil may be due to the need for lime to precipitate toxic aluminum quite as much as to neutralize soil acidity."

It is stated that the details of the experimental work upon which these observations are based are to be published elsewhere.

Vegetation as an indicator of the fertility of sandy pine plain soils in northern Wisconsin, T. J. DUNNEWALD (*Jour. Amer. Soc. Agron.*, 10 (1918), No. 1, pp. 19-23, fig. 1).—This paper, a contribution from the Wisconsin State Soil Survey, briefly summarizes results of chemical and mechanical analyses and of moisture studies of typical samples of sands and loamy and fine sands from widely separated points in cut-over areas of sandy pine lands in northern Wisconsin, in an effort to correlate the soils with the second growth of vegetation supported by them.

Mechanical analyses indicated that soils with small or sparse second growth must be classed as coarse or medium sands, and those with a large second growth as fine sand, the proportion of silt and finer sands being much greater in the latter. Chemical analyses showed that both of these soils were low in the principal plant food elements as compared with fertile soils. The greatest difference between them was deemed to be in the phosphorus content, the sandy group having about 14 per cent less phosphorus in the surface 8 in. than the loamy soils. The percentage of nitrogen was also approximately 14 per cent less in the sandy soil. Moisture equivalent determinations indicated that the loamy soils had about a 27 per cent greater moisture-holding capacity than the sandy soils.

"It is concluded that the character and size of the undergrowth of cut-over lands is a safe indicator of the cropping capacity of the soil for agricultural purposes on sandy pine plain lands. The heavier growth indicates a higher content of plant food, the presence of more fine material in the soil, and

especially a greater capacity of the soil to retain moisture and to enable vegetation and future crops to resist periods of drought."

Soil inoculation, P. E. BROWN (*Iowa Sta. Circ. 43 (1918), pp. 2-7*).—This presents a brief discussion of the soil and pure culture methods of inoculation for legumes, and briefly notes some experiments conducted at the station in a comparison of the two methods. Increases in yields and protein content followed both methods of treatment, and the conclusion was reached that the choice between the two methods must depend upon the expense and labor involved in their use.

[Progress report on soils work at the Delaware Experiment Station, 1917], T. F. MANNS (*Delaware Sta. Bul. 119 (1918), pp. 24, 25*).—Pot experiments with 50 different samples of Delaware soils receiving various applications of lime and commercial acid phosphate, pure acid phosphate, and manure are briefly noted. Observations on *Bacillus radicola* in a Chester loam soil showed about 4,100 organisms per gram of soil for the untreated check pot, 1,800 for the pot receiving pure acid phosphate, and 4,500 for the pot receiving commercial acid phosphate, the presence of the sulphur in the acid phosphate being regarded as a possible factor in stimulating the growth of the organism. An increase in the number of actinomyces was noted where manure and lime had been applied.

The best results with muck soils have been obtained from applications of from 1,000 to 2,000 lbs. of wood ashes per acre.

Woburn pot-culture experiments, 1916, J. A. VOELCKER (*Woburn Expt. Sta. Rpt. 1916, pp. 19-32, pls. 4; Jour. Roy. Agr. Soc. England, 77 (1916), pp. 251-264, pls. 4*).—A finely ground material, said to be radio-active natural ore containing 0.15 per cent of uranium oxid, was applied to wheat in quantities equivalent to 5 cwt., 10 cwt., and 1 ton per acre, respectively. It is concluded from the results obtained that no advantage whatever accrued from the application of the ore.

In a continuation of experimental work with Bottomley's "humogen," previously noted (E. S. R., 36, p. 517), applications of humogen, peat and nitrate of soda, and nitrate of soda alone were made to beans and mustard, the same relative amounts of nitrogen being present in each treatment. The humogen employed was said to be decidedly inferior in quality to that used before. The only treatment to show any benefit was that of nitrate of soda alone, the gain with peat being immaterial, and humogen producing practically no increase. The use of humogen also failed to show any increase of nitrogen formation in the soil.

Applications of "nitrolim" (calcium cyanamid), ordinary and granular, and dicyandiamid were made to soil one month before seeding to wheat, at time of seeding, and as a top-dressing for spring wheat to determine what ill effect if any, dicyandiamid had upon plant life. The results indicated that ordinary nitrolim did better on the whole than granular nitrolim, and that both were somewhat superior to dicyandiamid, the differences being more apparent in the top-dressings than in the earlier applications. Dicyandiamid used alone showed a slight reduction in yield, indicating that it may be slightly injurious, though not in the way nor to the extent alleged. Its presence in granular nitrolim was not deemed especially harmful to wheat.

Finely ground feldspar containing 8.5 per cent of potash was used with negative results on red clover at the rate of 10 cwt. per acre, with lime 5 cwt. sodium chlorid 2 cwt., and basic slag 5 cwt.

Acid soils from continuous wheat and barley plots receiving annual applications of ammonium sulphate since 1877 (E. S. R., 36, p. 519), were sown to wheat and treated with 1, 2, 3, and 4 tons of caustic lime and with calcium

carbonate in sufficient quantities to supply calcium oxid in the same amounts as did the caustic lime. Caustic lime proved to be markedly superior to calcium carbonate, except in large quantities, in point of germination, growth, and final development of grain and straw. Spurry, which is said to grow abundantly on these soils, was effectually suppressed by applications of more than 1 ton of caustic lime, while calcium carbonate appeared to have practically no effect on the weed. It is noted by way of a progress report that from 2 to 3 tons of caustic lime per acre may be safely used on such soils, while 4 tons would probably be excessive. In the case of carbonate of lime, an equivalent of 4 tons of lime per acre (about 7 tons of calcium carbonate) is not deemed excessive.

In continuing work with magnesium salts on wheat (E. S. R., 36, p. 519), the chlorid and sulphate were applied at rates of 0.1, 0.15, 0.2 and 0.4 per cent of the soil, respectively. It is concluded that magnesium compounds act differently on wheat according to the anion present; that magnesium chlorid may be beneficial in amounts up to 1 ton per acre, but beyond that may injure or totally destroy the crop; that magnesium sulphate may be safely and judiciously used up to 5 tons per acre; and that the increased nitrogen content of grain obtained by the use of magnesium oxid is not produced by magnesium sulphate.

Tests similar to the above were made with different sodium compounds applied to wheat, and included applications at rates of 0.01, 0.03, 0.1, 0.15, and 0.2 per cent of the soil with the hydrate and carbonate, and 0.1, 0.15 and 0.2 per cent with the chlorid and sulphate. The results are held to indicate that "different sodium compounds behave very differently both as regards the effect on germination and the growth of the wheat crop." The hydrate and carbonate, while at first retarding germination, eventually effected an improvement in the crop, including an increase in the nitrogen content of the grain, even at a rate of 2½ tons per acre. Sodium chlorid showed a beneficial influence in amounts not exceeding 1 ton per acre, but was detrimental to both germination and crop production in larger quantities. Sodium sulphate may be used in amounts up to 2½ tons per acre without detriment. Both the hydrate and carbonate produced a "caking" and a darkening of the soil, not observed with the chlorid and sulphate, which it is thought might interfere with the free growth of the plant and proper soil aeration under field conditions.

Farm manure, F. P. WEAVER (*Penn. State Col. Ext. Circ. 67 (1917), pp. 3-16, figs. 4*).—This bulletin deals with the conservation and use of barnyard manure for Pennsylvania farms and is based on experimental work at the Pennsylvania, New Jersey, and Ohio experiment stations.

It is concluded that for Pennsylvania farms nitrogen should be supplied to the soil by growing legumes, and that concentrated feeds should be bought rather than complete commercial fertilizers. All liquid manure should be saved and manure should be hauled to the field as made to prevent leaching and fermentation. It is also recommended that manure be reinforced with a phosphate.

The use of offal manure and dried blood from abattoirs, F. B. GUTHRIE (*Agr. Gaz. N. S. Wales, 28 (1917), No. 12, pp. 857, 858*).—The composition and method and rate of application of these materials are briefly discussed, emphasis being placed especially upon two points: "(1) That neither offal nor dried blood is a complete manure and (2) that good results are not to be expected if the soil is too dry."

The use of sulphate of ammonia as manure (*Bd. Agr. and Fisheries [London], Food Prod. Leaflet 15 (1917), pp. 3; Jour. Bd. Agr. [London], 24 (1917), No. 8, pp. 859, 860*).—The importance of making liberal use of sulphate of ammonia to increase crop production under war conditions is urged, and methods

of using it on different crops in connection with phosphatic fertilizers are described. The British Government has fixed the price of sulphate of ammonia (24.5 per cent) at £16 7s. 6d. (\$79.70) per ton in bags until May 31, 1918.

Blast furnace flue dust as a potash manure (*Jour. Bd. Agr. [London]*, 2, (1917), No. 8, pp. 852-855).—The potash content, price, and methods of obtaining and applying the flue dust as a fertilizer in England are briefly discussed. It is stated that four grades of the dust, varying in potash content from 2.75 to 13 per cent and in price from 37s. 6d. (\$9.19) to 100s. 6d. (\$24.62) per ton in bags, are now on the market. It is recommended that the dust be used especially on potatoes and applied sometime before planting.

The production of available phosphorus from rock phosphate by composting with sulphur and manure, P. E. BROWN and H. W. WARNER (*Soil Sci.*, 1 (1917), No. 4, pp. 269-282, figs. 3).—Experiments conducted at the Iowa Experiment Station on the production of acid phosphate on the farm by composting rock phosphate with sulphur and various farm manures are reported. Compost, cow manure, and horse manure were used. The compost consisted of a mixture of horse manure, cow manure, straw, hay, and other litter. The rock phosphate used contained 12.81 per cent total phosphorus. Precipitated sulphur was used.

It was found that "all of the manures and the loam tested contained efficient sulfofying organisms. The variations in the efficiency of the organisms in the manures and in the soil were too slight to be distinctive. A depression in phosphorus availability following the fermenting of the untreated horse manure and cow manure, but in the compost a slight increase occurred.

"The addition of sulphur to the manures resulted in greater solubility of the phosphorus than was found in the untreated manures. Composting floats with manure not only resulted in no increased availability of the phosphorus but in every case caused a noticeable depression which was not overcome at the end of 15 weeks' fermentation. Composting floats with manure and sulphur caused a remarkable increase in the production of available phosphorus which became greater with longer continued fermentation up to 15 weeks. This increase was greater where the sulphur and floats were intimately mixed with the manure than where they were added to the manure in layers. Experiments are necessary to ascertain the best amount of phosphate to mix with sulphur and manure to secure the highest percentage of availability."

Effect of sulphur and manure on the availability of rock phosphate in soil, P. E. BROWN and A. R. GWINN (*Iowa Sta. Research Bul.* 43 (1917), pp. 369-389, figs. 4).—Pot experiments conducted in a greenhouse are described which were planned to determine the effect of sulphur and of farm manure on the availability of raw rock phosphate when the last two materials were applied in amounts usually employed in ordinary farm practice and the sulphur in the proper proportion to react with all the rock phosphate used. Carrington loam and Miami loam soils were employed and the soluble phosphate production, the formation of sulphates, and the sulfofying powers of the soils studied. The pots received single applications at the rate of 12 tons of horse manure 2,000 lbs. of rock phosphate, and 500 lbs. of sulphur per acre together with combinations of manure and rock phosphate, manure and sulphur, rock phosphate and sulphur; and rock phosphate, manure, and sulphur at the rates indicated. The pots were kept bare and an optimum moisture content maintained. Samples of soil were taken at the end of 3, 6, 9, 12, 15, and 20 weeks and the soluble phosphorus and sulphates determined. The sulfofying power of the soil was determined at the end of 6, 12, and 16 weeks for the Carrington loam and at the end of 16, 20, and 24 weeks for the Miami loam. The results

the determinations are presented in tabular form, illustrated graphically, and fully discussed.

The conclusions reached may be summarized as follows: The addition of sulphur and manure to the soil increased the availability of the raw rock phosphate more so with the sulphur than with the manure. The greatest gain was obtained where both were used with the rock phosphate, the time of maximum availability varying with the soil. The production of sulphates paralleled in a general way the production of soluble phosphorus. The physical and chemical properties of the soils materially influenced the production of available phosphorus and sulphur. The various treatments and the soil type markedly affected the sulfofying power of the soil, phosphorus and manure increasing sulfofication. A rather definite relationship was also observed between the sulfofying power of the soil and the production of available phosphorus.

In an interpretation of their results the authors state "that under greenhouse conditions the availability of rock phosphate can be increased by applying either manure or sulphur with it. It also seems quite reasonable to assume from the experimental data that the rock phosphate is made available with sufficient rapidity to supply the needs of any growing crop. As an average, the increase in available phosphorus where sulphur was applied with the raw rock was over that where the raw rock was applied alone was about 80 lbs. per acre, where 2,000 lbs. of rock phosphate were applied. . . . The increase in available phosphorus due to the action of the manure was not as great as that due to the action of sulphur. Sulphur oxidation, then, is more effective in reducing available phosphorus than is the action of decaying organic matter. . . . From the data at hand it appears that the use of sulphur in conjunction with raw rock phosphate, as well as applying manure with it, would be a profitable practice."

Effects of lime and carbonate of lime on acid phosphate. G. S. FRAPS *Texas Sta. Bul. 223 (1917), pp. 5-16*.—This reports the results of analytical determinations and pot experiments to ascertain the effect of carbonate of lime and of hydrated lime on the availability of the phosphoric acid of acid phosphate in which these materials are used as fillers. The data are tabulated and briefly discussed.

The addition of from 0.5 to 10 gm. of precipitated calcium carbonate to 50 gm. of acid phosphate resulted in a fairly rapid decrease in water-soluble phosphoric acid and a less marked decrease in the citrate-soluble phosphoric acid. Similar applications of hydrated lime showed a more rapid and a greater decrease of available phosphoric acid. These results are held to indicate that the addition of 9 per cent of calcium carbonate would suffice to change 14.2 per cent water-soluble phosphoric acid to the reverted condition, or 7.1 per cent to the insoluble condition, provided the reaction was complete. Observations indicated that this was not the case, however, even after 20 days' treatment with the precipitated carbonate, and with the carbonate in a coarsely ground condition a complete reaction was deemed improbable.

The results of the pot experiments are said to have been rather unsatisfactory and indicated a reduction in the availability of the acid phosphate for corn and alfalfa due to the addition of lime.

The use of calcium carbonate as a drier in sufficient amounts to combine with the free phosphoric acid present in some acid phosphates is deemed justified, but when reacting with the acid phosphate moisture is liberated. Nitrate of soda used in conjunction with calcium carbonate increased the insoluble phosphoric acid much more than did sulphate of potash.

The author takes exception to the conclusions reached by Burgess (E. S. R., 35, p. 816) relative to the beneficial effects derived from a mixture of limestone and fertilizing materials and concludes that the use of ground limestone in a fertilizer in excess of 3 or 4 per cent is objectionable.

Ground limestone and prosperity on the farm, C. A. MOORE (Tennessee Sta. Bul. 119 (1917), pp. 189-200, figs. 4).—This presents a general discussion on the value of liming, both for the growing crop and for soil improvement, based on the results of experiments conducted in various parts of the State for the past 12 years. The need of lime on different types of soil in the State and the home grinding of limestone are also discussed, and brief notes are presented on the time and methods of applying ground limestone and on other forms of lime deemed of value for Tennessee.

Gypsum in 1916, R. W. STONE (U. S. Geol. Survey, Min. Resources U. S., 1916, pt. 2, pp. IV+255-261, map 1).—This report deals with production and imports of gypsum for the United States for 1916, production in Canada, and new developments in the gypsum industry, and gives mine and mill data and cost data on the production and marketing of gypsum plaster.

"In 1916, for the first time, the total value of the gypsum products of the United States in a single year exceeded \$7,000,000. Since 1912, inclusive, the annual output has been approximately 2,500,000 tons of raw material, but in 1916 the total production was over 2,750,000 short tons . . . In all but three of the gypsum-producing States there was an increase in production in 1916, which shows that the improvement in the industry was general and not local. As in former years, New York was the largest producer of raw gypsum, Iowa ranked second, and Michigan third. Production was made in 13 States and in Alaska. Sales are credited to Illinois, Minnesota, Washington, and Wisconsin, which are not producers of raw gypsum, because they contain mixing plants and warehouses that prepare plasters for the market. There was an increase in quantity, in average price per ton, and in total value of gypsum sold in 1916 for land plaster."

Fertilizers.—An interpretation of the situation in the United States, J. E. POORE (U. S. Nat. Mus. Bul. 102 (1917), pt. 2, pp. 22, pl. 1; Amer. Fert., 47 (1917), No. 10, pp. 25-35, pl. 1; abs. in Nature [London], 100 (1918), No. 2517, pp. 406, 407).—This article explains the functions, uses, and sources of fertilizers, but deals especially with the means of developing and maintaining an adequate domestic fertilizer industry in the United States.

It is pointed out that phosphates occur in abundance in this country, but "as this material must be treated with sulphuric acid to produce fertilizer, its manufacture is closely allied to the sulphuric acid industry. . . . The dependence of the United States upon Chile for sodium nitrate and the rising prices of organic nitrogen urge the desirability of an enlarged by-product coal industry and suitable building up of an atmospheric nitrogen industry in this country. The dependence of this country upon Germany in respect to potash is emphasized and the various war-developed domestic sources of potash described. The assistance that the domestic potash industry merits at the close of the war is discussed.

"In conclusion, the point is stressed that the best progress in the field of fertilizer will come through a true coordination of its various parts, both among themselves and together in respect to other industries, as the result of enlightened cooperation between the fertilizer industry, the Government, and the people."

Fertilizer supplies (Chem. Trade Jour., 61 (1917), No. 1596, p. 528).—Orders of the Food Production Department of the Board of Agriculture of Great Britain, with regard to control, distribution, prices, etc., of sulphate of am-

monia, basic slag, superphosphate, compound fertilizers, and blast-furnace fine dust, are briefly discussed, as well as the available supplies of these materials. A fairly good supply of all the materials except that furnishing potash (blast-furnace flue dust) is indicated.

"Potash was by far the most scarce of all fertilizers. To overcome the shortage, the Government had arranged for the erection of a potash factory. Meanwhile, the agricultural demand would be met, in a measure, by a supply of potash through the medium of dust taken from the flues of blast furnaces, which would be supplied through approved agents for direct application to the land at moderate prices."

Commercial fertilizers, 1917, C. D. Woons (*Maine Sta. Off. Insp.* 85 (1917), pp. 121-148).—This reports the actual and guaranteed analyses of 503 official samples of commercial fertilizers and fertilizer material and of 12 samples of lime and limestone collected during 1917. Two unguaranteed brands of land plaster were sampled and found to contain 22.4 and 26.9 per cent of calcium acid, respectively. Analysis of a sample of "musselizer," said to be dried mussel-bed mud, showed that it contained 0.63 per cent total nitrogen, 0.20 per cent total phosphoric acid, and 0.54 per cent potash.

Fertilizer analyses, A. J. PATTEN, F. F. BERGER, T. E. FRIEDEMANN, and P. O'MEARA (*Michigan Sta. Bul.* 230 (1917), pp. 3-48).—This reports the actual and guaranteed analyses of 928 official samples of commercial fertilizers and fertilizing materials, representing 320 brands collected during the spring and fall inspection of 1917. Deficiencies in one or more plant-food constituents were found in 29.3 per cent of all the samples analyzed. Nitrogen was found to be below guaranty in 8.4 per cent of the samples, total phosphoric acid in 0.4 per cent, available phosphoric acid in 5.9 per cent, and potash in 16.3 per cent.

The fertilizer outlook for 1918 is briefly discussed with particular reference to the increased cost of fertilizing materials.

AGRICULTURAL BOTANY.

Chemical and physical changes in apples during the ripening and storage period, W. P. SNYDER (*Trans. Ind. Hort. Soc.* 1916, pp. 403-411).—The apple fruit, considered as a living organism, has first a period of growth during which the dry matter, principally starch, is continually increased. A second, or ripening, period follows, during which starch is changed into sucrose. This in turn is gradually changed into invert sugar, with a gradual decrease of malic acid and of carbohydrates and an accompanying respiration of carbon dioxide. These changes are largely due to the activity of oxidizing enzymes, the oxygen of the air being drawn upon in the process.

The changes progress much more rapidly after picking, at high temperatures, and in the short-season varieties. Soon after picking, apples should be placed in cool storage to retard the processes above mentioned. Respiration continues during the storage period, becoming ultimately less active. Transpiration continues during the life of the apple. The third period is that of disintegration.

Injection experiments on plants, Y. YENDO (*Jour. Col. Sci. Imp. Univ. Tokyo*, 38 (1917), Art. 6, pp. 46, pls. 2).—In experimentation carried out with various plants, the author found that the rates of conduction in vegetable tissues differ greatly for different substances. Lithium nitrate was readily conducted, copper sulphate and eosin less readily, and anilin violet least readily of the substances tested. Injected substances move toward regions of free transpiration. Lithium goes to leaves rather than to inflorescences and other very young parts. It is carried toward the shoot from cotyledons, rhizome, bulb, or root. Lithium injected into the submerged parts of water plants goes

mainly to the aerial parts. Feeble conduction occurs in plants cultivated in the moist chamber. Conduction is much more ready in leafy than in leafless plants (winter condition). Conduction upward is conspicuous, conduction downward is generally less so, conduction transversely is very feeble. Conduction occurs mainly through the xylem elements, also through the phloem, but only to a slight degree through other regions. Speed of conduction is strongly affected by concentration. Certain fungi conduct lithium, algae hardly at all. Vascular bundles can be traced by the injection method as here employed.

Comparative length of growing season of ring-porous and diffuse-porous woods, F. W. HAASIS (*Plant World*, 20 (1917), No. 11, pp. 354-356).—A limited study of forest trees showed that those having ring-porous wood finished their summer growth at an earlier date than did those having diffuse-porous wood, which grew much faster earlier in the season than later. In case of an evergreen conifer, the growing season is prolonged, as in case of the diffuse-porous wood.

Relation of the rate of root growth in seedlings of *Prosopis velutina* to the temperature of the soil, W. A. CANNON (*Plant World*, 20 (1917), No. 10, pp. 320-333, figs. 3).—Giving a brief account of a portion of numerous observations made as part of a series of studies by himself on the physiological-ecological relations of roots (E. S. R., 36, pp. 525, 733; 37, p. 213), the author states that root growth in mesquite seedlings is limited by temperatures of 12 and 42° C. (53.6° and 107.6° F.). The most rapid growth occurred in a root having an initial length of 16 mm., which in 12 hours grew 51 mm., the temperature ranges of soil and of air being, respectively, 32.5 to 34° and 22.5 to 23.5°. Three types of growth rate variation are to be distinguished. The behavior of the root as regards growth rate and as regards variation of whatever kind in growth rate is probably to be associated with the relation of time of observation to the root's stage of development, that is, to the so-called grand period of growth.

Water cultures, F. THOMPSON (*DeLaure Sta. Bul.* 119 (1918), pp. 19, 20).—In this work, which was planned as a study of the limit of tolerance of seedlings to acidity (measured electrometrically) when grown in water cultures started in the spring and continued as long as the growth of water cultures in the greenhouse was practicable, the author employed the 3-salt solution used by McCall (E. S. R., 36, p. 212). One series was run with hydrochloric acid, and another at the same time with sodium chlorid. Owing to difficulties encountered in this work, potassium chlorid will be introduced hereafter as a component of the nutrient solutions.

Physiological studies on *Rhizophora*, H. H. M. BOWMAN (*Proc. Nat. Acad. Sci.*, 2 (1916), No. 12, pp. 685-688).—In work carried on by the author on the red mangrove at the Tortugas Laboratory of the Carnegie Institution during several years, emphasizing the transpiration rate of seedlings of *R. mangle* grown in different concentrations of salt water and in various soils, it was shown by specially devised experiments that the rate of transpiration varies directly with the concentration of the medium. The accelerating effect on transpiration of a certain soil is supposed to be due to chemical action.

Recent investigations on evaporation and succession, F. E. CLEMENTS (*Plant World*, 20 (1917), No. 11, pp. 357-381).—The publication by Gates (E. S. R., 37, p. 725) of his findings and related views on evaporation and plant succession has led to the author's examination of the conflicting views in this field, the results of which are published herein.

The steppes of Spain and their vegetation, E. REYES PRÓSPER (*Madrid: Sucesores de Rivadeneyra*, 1915, pp. 305, map 1, figs. 28).—Defining these steppes, comprising a total of 72,000 sq. km. (28,000 sq. miles) in Spain, as extensive areas showing an extraordinary predominance of lime or clay, with

little or no fertile soil as a rule and subject to extremes of temperature and to scarcity and variability of rainfall, the author makes a detailed report on the physical and chemical features, on the influence of soil and climate in relation to morphology, and on some ecological features of these areas. Some attention also is given to plants as related to various modes and phases of utilization.

Types of segregation, CAROLINE PELLEW (*Jour. Genetics*, 6 (1917), No. 4, pp. 317-339, pl. 1).—The results of studies carried on since 1912, relating mainly to the inheritance of certain abnormalities in the development of anthers and to the inheritance of flower color and of variegation in forms grouped under or related to *Campanula carpatica*, are given. The author claims that some of these forms have been introduced into cultivation from their native habitat, the mountains of Transylvania, and that others have doubtless originated under domestication, little being definitely known as to the origin of the various forms. Self-sterility is characteristic of most of the forms, this characteristic necessitating the employment of cross-fertilization.

Vegetative segregation in a hybrid race, R. R. GATES (*Jour. Genetics*, 6 (1917), No. 3, pp. 237-253, pl. 1).—The author describes a case of vegetative segregation, or remarkably wide somatic variability, combined with individual segregation in the F_2 and F_3 of hybrid races derived alike from *Oenothera rubricolor* × *O. biennis* and from the reciprocal cross. The segregating character in question is the size of flower or length of petal.

Studies on the hybrids of *Capsicum annuum*.—II, On some variegated races, S. IKENO (*Jour. Genetics*, 6 (1917), No. 3, pp. 201-229, pl. 1, figs. 2).—Studies carried out since 1913 are reported on a variegated race of *C. annuum*, which is said to have appeared first in 1913, supposedly by mutation (see below).

The author states that this race gave rise by self-fertilization to variegated plants exclusively, the offspring showing variation in wide degrees of this character, which is noted in leaves and branches. Variegation is transmitted from both the paternal and the maternal side. No self-colored green plant was produced by crossing variegated with green plants. Three variegated races were found agreeing perfectly as regards hereditary behavior. The transmission of variegation is thought to occur through the cytoplasm (particularly the plastids), and not through the nucleus.

[A note on some variegated races of *Capsicum annuum*], S. IKENO (*Jour. Genetics*, 6 (1917), No. 4, pp. 315, 316).—This contains a modification, with explanation, of the author's use of the term "mutation" in the article above noted.

Studies in the inheritance of doubleness in flowers.—II, Meconopsis, Althæa, and Dianthus, EDIRI R. SAUNDERS (*Jour. Genetics*, 6 (1917), No. 3, pp. 165-184).—Results are here detailed of this work, which was undertaken to ascertain whether in *M. cambrica*, *A. rosea*, or *D. caryophyllus* the mode of inheritance of the character of doubleness presents complex phenomena comparable to those shown by previous experimentation to occur in the stock (*E. S. R.*, 35, pp. 730, 731; 36, p. 826).

The author concludes that these plants differ greatly in this respect from *Matthiola*. Whereas in the stock no intermediate forms are known to exist between the single and the fully double forms, in the Welsh poppy, the carnation, and the hollyhock a more or less continuous series can be obtained. Other differences are indicated.

Sexual dimorphism and variation in *Ginkgo biloba*, N. M. GRIER (*Torreyana*, 17 (1917), No. 12, p. 225).—It is stated that personal observation of a few trees by the author tends to confirm the claim of nurserymen that the sex of

G. biloba can be detected by the habit assumed. The male tree, while retaining the conical type of stem, shows a tendency to approach the columnar form, while the conical outline of the female tree shows a much broader base. In the female trees the proportion of bilobed or divided leaves is said to be much less than in the male trees.

Recent studies on variation in *Micromycetes*, ELISA MUTTO and G. B. LACET (*Ann. R. Inst. Bot., Univ. Paris, 2. ser., 17* [1917], pp. 53-57, pl. 1).—A details here given of the forms previously discussed by the authors (E. S. p. 35, p. 547) show how considerable may be the influence exerted upon an organism as regards its characters by the medium in which it is cultivated.

Studies in the nomenclature and classification of the bacteria, II-V, R. G. BUCHANAN (*Jour. Bact., 2* [1917], Nos. 2, pp. 155-164; 3, pp. 347-359; 4, pp. 667-671; 5 [1918], No. 1, pp. 27-61).—In continuation of the paper previously noted (E. S. R., 37, p. 220), the second paper deals with the primary subdivisions of the Schizomycetes, the third with the families of the Eubacteriaceae, the fourth with subgroups and genera of the Coccaceae, and the fifth with the subgroups and genera of the Bacteriaceae.

FIELD CROPS.

Report of [field crops] work at Kodiak Live Stock and Breeding Station, C. C. GORBERSON and M. D. SNOODGEASS (*Alaska Stat. Rpt. 1916, pp. 11, 12, 13, 55, 62-64, pls. 2*).—This reports work with field crops conducted during 1917 in continuation of that previously noted (E. S. R., 36, p. 435).

The season is described as the coldest and most backward experienced since the station was established. All cultivated crops made slow growth, but still crops and pasture grasses remained green and succulent until late in the season.

The natural restoration of grasses on the ash-covered portions of Kodiak and adjacent islands is said to be progressing rather rapidly. The common fireweed (*Epilobium angustifolium*) and scouring rush (*Equisetum pratense* and *E. hyemale*) are most active in revegetating these areas. The seedling of tame grasses is giving satisfactory results. Bromo grass, redtop, and timothy made the best showing of the grasses sown in 1915, while creeping bent grass, meadow fescue, and Kentucky blue grass produced good stands but made little growth. Alfalfa winter-killed, but white clover seeded with all the above grasses proved winter hardy and made a good growth in 1916. Grass plots seeded in 1913 indicated that liberal applications of fertilizers were necessary for successful production on volcanic ash. All red clover winter-killed the first winter, very little of the alsike clover survived the three winters, and only a fair amount of white clover survived.

Work with the gang plow on the bench lands (first, second, and third beaches) is said to indicate a lack of sufficient soil below the ash to insure heavy crop production, there being too much gravel and not enough silt and clay to make a good mixture with the ash.

Tests with forage plants begun in 1914 were continued with field peas, cow kale, clovers, alfalfa, tame grasses, root crops, and small grains from seed produced at Fairbanks Station. The grains included oats, wheat, barley, spring rye, and buckwheat. Barley alone reached maturity, while the buckwheat and rye were a total failure. The general oat crop seeded for 187 from seed obtained in the open market was inferior both in yield and in size of head to Finnish Black and Norwegian Black oats from Alaska-grown seed. Cow kale was nearly a complete failure, turnips and rutabagas gave very poor yields, and sugar beets tried for the first time produced very poor results. Field peas seeded with oats made a fair growth.

Two species of native grasses (*Elymus mollis* and *Calamagrostis langsdorffii*) deemed of special value for silage and hay are briefly described. *E. mollis*, known as beach rye or beach grass, and found only in the vicinity of salt water beaches, is said to equal green oats for silage but is too succulent for hay. *C. langsdorffii*, or native bluetop, is regarded as an excellent hay crop if cut just as it is heading out, and it is also used for silage.

Report of [field crops] work at Fairbanks Station, J. W. NEAL. (*Alaska Stas. Rpt. 1916*, pp. 37-48, 51-53, pls. 3).—This reports the continuation of work with field crops during 1916 along the same general lines as that previously noted (E. S. R., 36, p. 435).

The season of 1916 is described as unfavorable, due to a wet late spring, a dry period in June, and a wet fall. The frost-free period extended over an interval of 98 days, with spring seeding 11 days later than in 1915.

In variety tests with cereals 5 varieties of winter rye, 1 of winter wheat, 4 of spring wheat, 1 of buckwheat, 1 of spring rye, 6 of oats, and 3 of barley attained maturity. Brief notes on the time of seeding, length of the growing period, lodging, and general condition of the crop at time of harvest are presented for each variety.

Oregonburg, Hansen Semipalatinsk, Hardy Grimm, North Swedish, Hansen Chorno, and Hansen Cossack alfalfas seeded in 1915 all survived the winter and made a very fair crop in 1916. Small plants of red and white clover seeded late in May were in bloom by the middle of July.

A mixture of oats and barley seeded for hay on soils that remained wet too late for a seed crop produced at the rate of a little more than 1 ton of cured hay per acre.

An estimated yield of 1,200 lbs. of clean turnip seed was obtained from a planting of 218 bu. of selected roots. Considerable labor is said to be involved in growing a turnip seed crop in Alaska, owing to the fact that the stems are still quite green long after the pods ripen. A plot of 1.5 acres sown to turnips from station seed of the 1915 crop produced 500 bu. of roots.

Variety and fertilizer tests with potatoes were begun, but owing to the appearance and rapid spread of a blight the work was abandoned. The prevalence of both scab and rust on the tubers, even after treatment with formaldehyde, has been noted before, but soaking the seed for 2 hours in a 1:30 solution seemed to practically check scab in 1916.

Methods for maintaining soil fertility under conditions prevailing at the station are briefly discussed. Crop rotation is deemed adequate if sufficient cleared acreage is available, but otherwise the use of commercial fertilizers, green manures, and fallow are recommended.

Distribution of small amounts of turnip seed and of several varieties of grain among farmers for cooperative seed-demonstration tests was made in an effort to encourage the production of early maturing and hardy strains of field crops.

Report of [field crops] work at Rampart Station, C. C. GEORGESEN and G. W. GASSER. (*Alaska Stas. Rpt. 1916*, pp. 17-22, 23-25, pls. 3, fig. 1).—Work with field crops similar to that previously noted (E. S. R., 36, p. 436) was continued during 1916.

Based on meteorological data for the past 10 years, the winter of 1915-16 was regarded as normal. The frost-free period for 1916 was 89 days, 8 days less than the 10-year average.

The clearing and preparation of additional land for cropping is noted. Observations made on cultivated, sod, and uncleared land to ascertain whether or not the soil froze as deep as it thawed the previous summer were held to indicate that the winter freeze penetrated as deep as the seasonal thaw, even under the most favorable conditions.

The work with alfalfa includes the increase by seed production of valuable sorts, the selection of promising individuals, and the production of new strains by hybridization. *Medicago falcata* continues to give the best results of the varieties tested, but improvement is deemed necessary to overcome its partly procumbent habit of growth and its seed-shattering propensities. Observations were made of individual plants spaced 2 by 3 ft. in the field, and seed from selected plants was collected for further testing. A half-acre tract of Grimm alfalfa seeded two years ago continued to make a vigorous growth. Individual plant selections have been made on this plot, and the seed have been planted separately, one selection possessing the erect habit of growth and the spiral pods of the Grimm type and giving evidence of possessing the hardiness of *M. falcata*. Disco and the so-called Hardy Grimm appeared to be about as hardy as regular Grimm. Semipalatinsk alfalfa ripened some seed, but was apparently winterkilled. Seed from a quite erect plant was kept separate. Cherno, Mongolian, and sand lucern seeded in small plots in 1914 had practically all died out by the spring of 1916. In reciprocal crosses between *M. falcata* and Grimm, only about 2 per cent of the blossoms treated produced seed. The author advocates seeding the two varieties in adjacent plots located as far as possible from other alfalfa and allowing open cross-pollination by insects.

Variety testing and hybridization work has been continued with spring and winter wheat, barley, oats, and rye. The F₂ and F₃ generations of wheat crosses made two years ago, using Chogot as the staminate parent and Irkutsk, Marquis, Romanow, and H. G. as pistillate parents, are described as disappointing. Irkutsk was the best spring rye variety tested, but the crop as a whole is deemed the least suited to local conditions of all the grains grown at the station. Seedlings of winter rye made on lowland in July, 1915, are said to have done remarkably well, with very little winterkilling, although about 20 per cent of the crop lodged. Thirteen varieties of spring wheat were tested, of which Chogot seeded on a 0.41-acre plot yielded at the rate of 17 bu. per acre and matured in 90 days. The grain is hard and is said to be of good milling quality. Single-head selections of Chogot have been made in an effort to obtain a strain that does not shatter when ripe. Observations of selections having clasped and open glumes have indicated a correlation existing between closeness and ripeness. A study is also being made with both wheat and barley of early and late ripening heads from the same plant, seed from early and late heads being selected and planted in adjacent rows. The earliest heads were almost invariably the smallest. Tests of winter-wheat varieties included plots of Kharkov, Sandomirka, Andrischinskaya, and Klondike, the last being completely winterkilled and the other three varieties about 75 per cent resistant. Kharkov lodged almost completely and Sandomirka about 25 per cent. In barley variety tests, a two-rowed, bearded sort from Sweden known as Gold was grown for the first time. It attained a height of 35 in. and tillered freely, each tiller producing a head. The straw was strong, scarcely 5 per cent lodging. This variety required a growing period of 100 days. Notes are presented on different varieties and hybrids of oats, which is said to be the principal cereal crop grown. The greater part of the crop is cut for hay. The small central kernel occurring in spikelets of Hansen, Norwegian, and Banner oats was seeded separately and compared with large kernel seed. The small kernel seed from Hansen produced some plants as vigorous as those from the large kernels, also some inferior plants, while with Norwegian and Banner the results were less favorable for the small seed.

The plot of *Vicia cracca* seeded in 1914 continued to make a satisfactory growth. Tests of hairy winter vetch and gore tares received from Sweden are briefly noted.

Comparative tests of single eye and normal seed pieces of potato, each planted in three 210-ft. rows, resulted in yields of 172.33 and 225 lbs., respectively. Burpee Superior grown on a 0.5-acre plat yielded at the rate of 5.6 tons per acre, and Irish Cobbler grown on a $\frac{1}{2}$ -acre plat at the rate of 4 tons per acre. Thirty-two additional varieties were grown on 50-hill plats, but no comparison of yields was made due to an affection of the leaves and stalks of practically all varieties, thought to be due to a combination of sun scald, tipburn, and early blight. Irish Cobbler and Uncle Gideon Quick Lunch seemed to be most susceptible, while Burpee Superior was practically immune. The tubers of affected plants were uninjured.

[Report of field crops work at the Delaware Experiment Station, 1917], A. E. GRANTHAM and T. F. MANNS (*Delaware Sta. Bul. 119 (1918)*, pp. 8-17, 19, 26).—Fertilizer, rotation, and variety tests with wheat, corn, oats, and soy beans are briefly noted and some of the more striking results indicated.

Liming is said to have increased the yield of hay in a rotation of corn, soy beans, wheat, and red clover by nearly 40 per cent. Corn yields have been increased from 6 to 8 bu. per acre over the unlimed soils. Lime has shown little effect on the yields of wheat and corn not grown in rotation. Of the different elements applied singly, phosphorus has shown the most marked effect on wheat, while phosphorus and potassium together have given the greatest net profit per acre. Nitrogen used with phosphorus and potassium has failed to give a profit with either wheat or corn in rotation. Potassium gave the best results of any single element on both corn and soy beans.

Corn grown in rotation with wheat and red clover yielded about 25 bu. per acre more than that grown in rotation with soy beans and timothy. In a rotation of alfalfa, corn, and wheat the corn yields have averaged from 90 to 95 bu. per acre and the wheat yields about 30 bu.

Tests of various forms of lime and phosphorus carriers are said to indicate that carbonate of lime is nearly as efficient as burned lime for sweetening the soil. High magnesia lime has given about as good results as high calcium lime. Acid phosphate, basic slag, sodium phosphate, bone meal, and raw rock phosphate were found to be effective in the order named.

In variety tests with wheat Gypsy, Rudy, Red Wonder, Valley, and Miracle, all bearded types, have produced the highest yields. Leap Prolific, Currell Prolific, Poole, Harvest King, and Early Ripe are deemed best among the smooth varieties.

Johnson County White is considered to be one of the best corn varieties for fertile land, while good yields have been obtained with Leaming and Reid Yellow Dent.

About 40 varieties of oats have been tested. Spring oats have not proved profitable.

The progress is briefly noted of studies on the assimilation and utilization of plant food by different varieties and types of wheat, the relation of lime to the decomposition of crude organic matter in the soil, and the effect of variations in physical characters and chemical composition of the corn kernel on the vigor and yield of the plant.

Observations on sweet potatoes in storage indicated that the loss of moisture under the usual storage conditions amounted to from 10 to 20 per cent, with about an 18 per cent loss near the stoves and about a 14 per cent loss in the alleys. The loss in blus was from 10 to 12 per cent. Field work in 1917 is said to have further confirmed the fact that liming increases the pox disease of sweet potatoes.

Variety testing and crop improvement (*Nevada Sta. Rpt. 1917, pp. 39-43*).—This reports the results of variety tests with wheat, oats, barley, corn, field peas and beans, millet, potatoes, and field beets.

Of the cereal crops tested in 100-ft. rows the highest yielding varieties for the two years 1915 and 1916 were Galgalos Five wheat (C. I. 2398), with approximately 65.4 bu. per acre; Early Mountain No. 2 oats (C. I. 656), with 81.7 bu.; and New Zealand barley, with 80 bu. Of the varieties grown in plot tests White Club wheat, Great Dakota oats, and Chevalier barley were first, with respective yields of 55.5, 35.2, and 59.5 bu. per acre. Little Club wheat with 48.5 bu. and Coast barley with 29.6 bu. were highest in cooperative tests made during 1915 and 1916. Improved Leaming corn grown for silage has produced at the rate of 22,570 lbs. per acre for a 4-year period and Sweepstakes at the rate of 21,155 lbs. for a 2-year period.

A number of forage crops have been tested for seed production with maximum yields for a 2-year period of 1,667 lbs. of seed per acre for Kaiser field peas, 1,521 lbs. for Amorita field peas, and 1,506 lbs. for Sudan grass. Of the forage crops tested for hay production Sudan grass gave the highest average yield for a 2-year period, 5,121 lbs. per acre. Green Canada field peas, with an average yield of 4,188 lbs. of forage per acre, was first among the field-pea varieties tested. Siberian and Hog millets were highest, with average yields of 5,430 and 5,210 lbs. of forage per acre, respectively. The highest yielding potato varieties were Great Divide and Burbank, with 4-year average yields of approximately 292.6 and 170 bu. per acre. Our Ideal mangels were first of the root-crop varieties tested, with 31,460 lbs. per acre for a 3-year period.

Progress report, Substation No. 9, Pecos, Tex., 1910-1914, J. W. JACKSON (*Texas Sta. Bul. 221 (1917), pp. 3-21, figs. 4*).—This reports the results of variety and field tests with cotton, cereals, grain and forage sorghums, broom corn, cowpeas, alfalfa, Sudan grass, sorgo-legume mixtures for hay, tobacco, peanuts, beans, and miscellaneous plant introductions on the Pecos substation in western Texas, all crops being grown under pump irrigation. Available meteorological data show wide variations in temperature and rainfall. The date of the last killing frost in the spring is said to vary from February to April, and that of the first killing frost in the fall from October to December, with a mean annual temperature of 64.4°. The annual precipitation varied from 5 to 20 in. over an 8-year period. The experimental work reported was conducted during the period of 1912-1914, inclusive, when the rainfall was above the average.

Four varieties of cotton have been tested during each of the 3 years with the following average yields of seed cotton per acre: Long Staple 1,144 lbs., Mohane Triumph 881.6 lbs., Allen Long Staple 775 lbs., and Yuma 472.6 lbs. By way of a preliminary observation it is suggested that cotton be irrigated very slowly in rather deep, narrow furrows.

Variety tests with small grains have, as a rule, been unsatisfactory due to attacks by rabbits and damage by wind. The 1914 results are said to have been more promising, 19 wheat varieties yielding at the rate of from 9 to 27 bu. per acre and 3 barley varieties at the rate of from 27.5 to 38.75 bu.

Alfalfa production has proved to be rather unsuccessful due to the heavy water requirement of the crop. Peruvian and home grown American are said to be the most promising types.

Fair yields of corn of inferior quality have been obtained but the crop is regarded as second to the grain sorghums except in protected places. Peanuts have proved to be rather unsatisfactory, the Spanish giving the best results in variety tests.

Rep Ripper and Unknown (T. S. No. 56) cowpeas produced average yields of clean seed of 454 and 425 lbs. per acre, respectively, while in tests for forage production in 1912 the highest yields were obtained from Unknown with 2,500 lbs. per acre, Iron with 2,330 lbs., New Era with 2,160 lbs., and Whippoorwill with 2,140 lbs.

The grain sorghums are deemed the most satisfactory grain crop for this region. In variety tests Dwarf Milo and Early Blackhul Kafir have given year average yields of 35.23 and 25.87 bu. per acre, respectively. Spacing tests with grain sorghums sown in 36-in. rows in 1914 gave maximum yields of 20.35 bu. per acre for Kafir corn sown with 14 in. between plants in the row and 28.76 bu. for milo maize sown with 16 in. between plants. The sweet sorghums proved to be valuable hay and silage crops. Sunac, Minnesota Amber, and Red Amber produced average yields for 1912 and 1914 of 15,608, 2,250, and 9,745 lbs. per acre, respectively. Standard, Dwarf Standard, and Dwarf broom corns yielded 1,015, 885, and 790 lbs. of cured brush per acre for the same period.

Date of seeding tests with Sudan grass are held to indicate that the time of seeding is not very important. A comparison of 15-, 20-, 30-, and 40 lb. rates of seeding for drilling Sudan grass in 1913 gave yields of cured hay of 2,500, 4,770, 4,390, and 5,160 lbs. per acre, respectively. Seeded in rows at the rate of from 5 to 10 lbs., Sudan grass produced from 200 to 745 lbs. of seed per acre.

In a test of sweet sorghum and cowpea mixtures for hay in 1914 the highest yield of cured hay, 2.74 tons per acre, was obtained from a combination of Sunac sorghum and Groit cowpeas. This practice is not deemed profitable.

[Report of the department of agronomy of the West Virginia Experiment Station, 1915-16], I. S. Cook (*West Virginia Sta. Rpts. 1915-16*, pp. 13-15, 16, 17).—Of 34 varieties and strains of soy beans tested during the past year 4 station selections have been among the first 6 in the yield of beans. Early varieties of oats have proved superior to late varieties and spring to winter varieties. Culberson winter oats and selections from them are deemed best for the northern part of the State, with Winter Turf second. Tennessee Winter barley and one or two other strains are considered quite promising and compare favorably with the spring varieties. In tests with three pure strains of wheat sown singly and in mixtures, the best strain was 22 per cent better than the check, 13.6 per cent better than the poorest strain, and 7.2 per cent better than the second best. A mixture of the three strains exceeded the best single strain by 8.6 per cent, while mixtures of the best and second best, the poorest and second best, and the poorest and best strains dropped 7.8, 14.3, and 10.6 per cent, respectively, below the best.

Preliminary observations on a comparative test of hill and row methods for determining the relative yields of selected strains of corn may be summarized as follows: Depth of color in young plants was thought to bear a negative correlation to germinative vigor and a positive correlation to vigor of later growth. In certain cases pollen was shed during the whole period in which the silk of the plant was receptive, while in other cases all the pollen was shed before the silks appeared. By guarding against the overtopping of some strains by more vigorous adjacent ones frequent replications of small plots gave more nearly accurate results than the same area in larger plots and fewer replications. When two or more strains differing from each other in vigor were grown in the same hill the normal difference was exaggerated, due to overtopping by the more vigorous strain, this being deemed of importance in determining actual differences not otherwise accurately measured. In 249 full hills, each with four stalks from the same parent ear spaced in a square

with 5 in. between stalks, the location of the stalk in the hill apparently affected the yield. With the 249 hills arranged in 10-hill groups and the average yield of the south by west corner considered as 100 per cent, the yield of the west by north corner was 91.2 ± 2.5 per cent, that of the north by east corner 91.4 ± 2.81 per cent, and that of the east by south corner 93.2 ± 2.11 per cent.

Grimm, Baltic, and other hardy strains of alfalfa have not proved superior to common alfalfa from northern-grown seed except in respect to seed production. Grimm has given the highest yield of seed.

Tests with buckwheat showed an increase in yield of 9.24 bu. in favor of early seed bed preparation. A seeding rate of 4 pk. per acre produced 2.3 bu. more than 3 pk. and practically the same as 5 and 6 pk. The average acre yield of Japanese buckwheat was 41.05 bu., of Silver Hull 35.9 bu., and of a mixture of the two of equal parts by weight 42.95 bu. There was practically no difference in yield between drilled and broadcasted seed. The heavy crop of buckwheat produced is said to have been a failure as a nurse crop for red and crimson clovers, vetch, and alfalfa.

[Work with field crops on the Seottsbuff reclamation project experiment farm in 1916], F. KNORA (U. S. Dept. Agr., Bur. Plant Indus., *Work Seottsbuff Expt. Farm, 1916*, pp. 1-11, 12-13, fig. 1).—This reports the continuation of work previously noted (E. S. R., 36, p. 132) with data on weather and crop conditions for 1916.

In trials with leguminous and nonleguminous pasture crops grown alone the most promising grasses were wheat grass, smooth brome grass, and meadow fescue with average yields of dry forage of 3,246, 2,921, and 2,856 lbs. per acre, respectively. Alfalfa with a yield of 8,440 lbs. and alsike clover with 6,295 lbs. were first among the legumes tested. Trials of mixtures of various grasses and legumes are reported in which the maximum yield, 5,973 lbs. of dry forage per acre, was obtained from a mixture of blue grass and white and alsike clovers. The total average yield of the same crops grown separately amounted to 5,356 lbs. per acre.

The results obtained from growing crops in rotation under irrigation are said to show that in every instance the highest yields of potatoes and corn were secured after alfalfa, potatoes showing an increase of 113 bu. per acre. Potatoes showed an increase in yield of 46.8 bu. and beets one of 4.24 tons per acre with manure. Beets following oats or potatoes which followed alfalfa showed an increase of 5.69 tons per acre in favor of alfalfa land. Alfalfa seeded in grain stubble in the fall has produced a 4-year average yield of 4.32 tons per acre the following spring as compared with 1.46 tons from that seeded in the spring.

Variety tests with grain included spring wheat, oats, and barley. Ghirka and Lambahara, with 6-year average yields of 33.3 and 32.9 bu. per acre, respectively, were highest among the bread wheats, while Arnautka, with 33.5 bu., and Beloturka, with 32.8 bu., were first among the durum varieties. Canadian and Kherson, with respective yields of 78.2 and 70.1 bu. per acre, were the highest yielding oat varieties for a 3-year period. Moravian was first among the 2-rowed types of barley, with a yield of 76.9 bu. for a 5-year period, and Han River, with 74.1 bu., for the 6-rowed type. Four 2-rowed varieties produced an average of 68.2 bu. as compared with 57.2 bu. from 8 6-rowed varieties.

Date-of-seeding tests with barley resulted in yields ranging from 47.6 to 32.9 bu. per acre for seedings made from March 20 to May 12. Similar tests with corn resulted in average yields ranging from 37.9 to 43.3 bu. for plantings made from April 20 to May 21.

Potatoes grown from various kinds of seed stock produced 3-year average yields ranging from 134 bu. for field-run seed to 247.2 bu. for immature seed Pearl and from 207.4 bu. for field-selected seed to 314.4 bu. for immature seed of Eureka.

Cultural tests with alfalfa resulted in yields of 6.46 tons per acre with a 4-ton application of manure in early spring, 4.19 tons with spring-tooth harrowing, 3.96 tons with disking, and 5 tons with the untreated check. Tests of various strains of alfalfa resulted in yields ranging from 3.49 tons per acre for native strain grown in eastern Wyoming to 4.76 tons for Baltic.

Dry farm crop rotations and cultural methods, A. ATKINSON, J. M. STEPHENS, and G. W. MORGAN (*Montana Sta. Bul. 116 (1917), pp. 54, figs. 6*).—Considerable tabulated data are presented and fully discussed by way of a preliminary report of experimental work on continuous cropping, crop-rotation systems, and cultural methods for field crops under dry-land conditions in progress on the Judith Basin substation since 1908 and on the Huntley experiment station farm since 1912 in cooperation with the U. S. Department

Agriculture. The average annual precipitation at Judith Basin for the period of 1898-1915 was 16.66 in., 10.9 in. of which fell between April 1 and September 30. The average annual precipitation at Huntley for the past 9 years has been 13.74 in., 8.42 in. falling from April to September, inclusive. The average mean temperatures for the months of April to September, inclusive, have been 54.8° at Judith Basin and 59.7° at Huntley. The average wind velocities for the same period have been 6.3 miles per hour at Judith Basin and 4.1 miles at Huntley.

The crop rotation data, reported from Judith Basin, are from 27 different cropping systems, including 2-, 3-, 4-, 5-, and 6-year rotations of winter and spring wheat, oats, barley, corn, flax, brome grass, alfalfa, and clover; and those on Huntley from 29 cropping systems, including 2-, 3-, 4-, and 6-year rotations of the same crops. Continuous cropping tests were conducted at each station with winter and spring wheat, oats, corn, and flax, and with barley at Judith Basin. These crops received various treatments as follows: Spring plowing to a depth of 4 in., except for winter wheat, which was plowed just before seeding; fall plowing to a depth of 7 or 8 in., alternate summer fallowing and spring plowing; fall plowing and subsoiling; fall listing; and, at Judith Basin, spring plowing to a depth of 7 or 8 in. for spring wheat, and spring listing for corn. The observations may be summarized as follows:

In two-year rotations of spring grains and corn and spring grains and fallow, and in three-year rotations containing spring grains for two years, and either corn or fallow the third year, those rotations containing corn have been more profitable than those with fallow. In three-year rotations containing two years of small grain and one year of corn it has been found more profitable to disk the corn land than to plow it as a preparation for one of the small-grain crops.

Rye was more profitable than peas as a green-manure crop. Three-year rotations containing a green-manure crop were less profitable than four-year rotations containing a green-manure crop, while both three- and four-year rotations containing green-manure crops have been less profitable than similar rotations where clean fallow replaced the green manure.

Rotations containing sod crops for two or three years have given comparatively low profit, brome grass having been a little more profitable than alfalfa as a sod crop.

Winter wheat cropped continuously showed the greatest profit from fallowing at Judith Basin, while summer fallowing has shown the least profit. At Huntley the most profitable method was summer fallowing, subsoiling being

the least profitable. With spring wheat listing has been the most profitable and summer fallowing the least profitable method of seed-bed preparation at Judith Basin. At Huntley listing was the most profitable.

At Judith Basin listing has been the most profitable and summer fallow the least profitable practice with oats. Listing was most profitable at Huntley.

At Judith Basin corn on spring plowing was most profitable and on summer fallow least profitable. At Huntley corn on spring listing was most profitable and on summer fallow least profitable.

At Judith Basin spring plowing has been most profitable with flax and summer fallow least profitable. At Huntley flax on fall plowing has been most profitable and on subsoiling least profitable.

Irrigation experiment with alfalfa, potatoes, and wheat (*Nevada Sta. Rep. 1917, pp. 27-39*).—This reports the progress of work previously noted (*E. S. R. 37, pp. 30, 435*), giving results for the season of 1916 which largely confirm those already obtained.

More detailed data are presented than heretofore on variations in soil moisture during irrigation, giving the average percentage for the first 4 ft. of soil for the different applications and at the various wilting stages employed in these investigations. With alfalfa the greatest variation was found in the last wilting stage with the 12-in. application, the soil moisture content at the second cutting being 61.4 per cent less than before the first irrigation. The 6- and 9-in. irrigations given before the plants showed need of water, resulted in actual increases in soil moisture at the second cutting of 9.7 and 37.2 per cent, respectively. In every other case there was a decrease which became greater as the wilting stage advanced. No uniform variations were observed with potatoes except in the case of 3-in. applications, which showed a maximum decrease of 9.7 per cent at harvest time where the plants were irrigated after they failed to revive at night.

Comparisons were made of the soil moisture content before the first irrigation of wheat and before irrigation at the milk stage where one and two irrigations were omitted. With the omission of one irrigation the greatest decrease amounted to 56.3 per cent with 3-in. applications, and to 17.4 per cent with 7-in. applications where the irrigation at the bloom stage was omitted. The smallest decrease of 18 per cent with 3-in. applications was with an irrigation omitted at the milk stage, while an increase of 3.7 per cent occurred with 7-in. applications. The average decrease for all 3-in. applications was 28.6 per cent, and for all 7-in. applications 4.5 per cent. Where two irrigations were omitted the greatest decrease of 60.5 per cent with 3-in. applications, and of 32.9 per cent with 7-in. applications occurred where irrigations were omitted at the boot and bloom stages. The smallest decrease occurred with the omission of irrigations at the 5-leaf and dough and the milk and dough stages, amounting to an average of 12.2 per cent for 3-in. applications, and of 1.8 per cent for 7-in. applications. The average decrease for all 3-in. applications was 28.9 per cent, and for all 7-in. applications 10.6 per cent.

A further comparison was made of the soil moisture content before the first irrigation of wheat and at harvest with the omission of one and two applications and of two consecutive irrigations. The greatest decrease with 3- and 7-in. applications where one irrigation was omitted amounted to 45.4 and 12.2 per cent, respectively, where an irrigation at the dough stage was omitted. The smallest decrease of 9.1 per cent with 3-in. applications occurred with an irrigation omitted at the milk stage, while with the 7-in. applications the greatest increase, 10.3 per cent, occurred with an irrigation omitted at the bloom stage. The average decrease for all 3-in. applications was 23.9 per cent, while for 7-

in applications there was an average increase of 1.5 per cent. When two irrigations were omitted the greatest decrease with 3-in. applications amounted to 3.0 per cent when irrigations at the 5-leaf and milk stages were omitted. The smallest decrease, 3.1 per cent, occurred when irrigations at the boot and milk stages were omitted. No uniform variations were observed in the case of 7-in. applications, the greatest decrease at time of harvest being 4.8 per cent with irrigations omitted at the boot and milk stages, and the greatest increase, 2 per cent, with irrigations omitted at the 5-leaf and bloom stages. With the omission of two consecutive irrigations decreases in soil moisture content at harvest time with 3-in. applications omitted at the milk and dough, the bloom and milk, the 5-leaf and boot, and the boot and bloom stages were 19.5, 11.9, 16.8, and 3.1 per cent, respectively, while with the 7-in. applications the respective increases were 6.1, 9.4, 2.5, and 0 per cent. The average decrease for all 3-in. applications was 13.3 per cent and for all 7-in. applications 0.5 per cent. Where only two applications were made, one before and one after heading, the greatest decrease in soil moisture occurring before the second irrigation was with 9-in. applications before and after heading and amounted to 23.1 per cent. The smallest decrease was 8.3 per cent with a 9-in. application before and a 3-in. application after heading. The greatest decrease at time of harvest was 2 per cent with a 12-in. application before heading and a 6-in. application after heading. The smallest decrease, 10.6 per cent, occurred with 6-in. applications before and after heading.

Date- and rate-of-seeding tests with spring grains under irrigation. A. KISSOX (*Montana Sta. Bul. 120 (1917), pp. 105-117*).—This bulletin reports the results of experiments with standard varieties of spring wheat, oats, barley, and peas conducted on irrigated land at Bozeman at an altitude of 4,870 ft. to determine the effects of different dates and rates of seeding on the yield of grain and straw, the quality of the grain, the length of the growing period, the height of the crop, and the percentage of lodging. The results are summarized in tabular form and briefly discussed.

In the date-of-seeding tests plantings were made on the first day that a seed bed could be properly prepared each spring for seven years with wheat, oats, and barley, and for six years with peas, and successive plantings made on the same day of the week for each of the seven weeks following. The average date for the first planting for the grain crops was April 15 and the last planting was June 4, while with the peas the first and last dates were April 18 and June 5, respectively. The average acre yields of grain obtained from the early plantings (first four planting dates) were 58.12 bu. for wheat, 56.16 bu. for oats, 50 bu. for barley, and 41.86 bu. for peas, as compared with 40.19, 80.75, 64.48, and 37.39 bu., respectively, for the late plantings (last four planting dates). No important differences were observed in the amounts of straw produced from crops planted on the different dates, but the average number of pounds of straw per pound of grain secured was deemed significant and amounted to 2.04 for wheat, 1.59 for oats, 1.43 for barley, and 1.48 for peas for the early plantings, compared with 2.57, 1.8, 1.67, and 1.58 lbs., respectively, for the late plantings. The quality of the grain harvested from plots planted on different dates is determined by the average weight per measured bushel. For the early plantings these weights were 60.02 lbs. for wheat, 41.82 lbs. for oats, 52.94 lbs. for barley, and 62.25 lbs. for peas, as compared with 57.3, 37.94, 51.19, and 62.02 lbs., respectively, for the late plantings. Early planted grain utilized a longer growing period than that planted late in every case, the average number of days from seeding to maturity from the first planting date to the last ranging from 139.17 to 118.83 for wheat, from 125.14 to 111 for oats, from 134.43 to

110.33 for barley, and from 131 to 101.8 for peas. The height of the various crops varied from year to year, but differences between crops planted on different dates were regarded as relatively unimportant. The lodging of the crop is said to depend more on the season than on the date of planting.

The same crops were used in the rate-of-seeding tests and were planted at rates of 2, 4, 6, 8, 10, 12, 14, and 16 pk. per acre each spring for 8 years for wheat, oats, and barley and 7 years for peas. The maximum yields of grain were obtained from the heavier seedings, as follows: Wheat, 60.13 bu. at a 14-pk. rate of seeding, 106.44 bu. for oats at a 12-pk. rate, 76.73 bu. for barley at a 16-pk. rate, and 42.19 bu. for peas at a 16-pk. rate. Slightly higher yields of straw were also secured from the heavier rates of seeding. With wheat, oats, and barley the weight per measured bushel of grain increased slightly as the rate of planting increased, but with peas the highest weight was obtained with the lighter plantings. With the exception of peas, which remained practically constant at 124 days, the average length of the growing period decreased from the lowest rate of seeding to the highest rate, with an average range of from 129.2 to 124.1 days for wheat, from 122.1 to 118.7 days for oats, and from 125.1 to 118.5 days for barley. The length of straw varied but slightly with the cereal crops, while in the case of peas the length of the stem increased from 45 in. for the 2-pk. rate to 51.2 in. for the 14-pk. rate. A definite relation between the rate of seeding and lodging was observed, the percentage increasing from the lowest rate to the higher rates. Wheat varied from 25 per cent at the 2-pk. rate to 34.37 per cent for the 16-pk. rate, oats from 2.85 per cent for the 2-pk. rate to 35.7 per cent for the 16-pk. rate, and barley from 40 per cent for the 2-pk. rate to 66.62 per cent for the 14-pk. rate. Recommendations for seeding grains on these irrigated lands are made as follows: For spring wheat 8-pk., for oats 10 to 12 pk., for barley 8 to 10 pk., and for peas 10 to 12 pk. per acre.

Cooperative grain testing among Matanuska Valley farmers, M. D. Snodgrass (*Alaska Stat. Rpt. 1916*, pp. 66-69, fig. 1).—Cooperative tests were begun in 1916 by settlers in the Matanuska Valley of a few of the better yielding varieties of grains grown at the Rampart and Fairbanks stations. The test as a whole were regarded as rather unsuccessful, due principally to unfavorable weather conditions, but the results are thought to demonstrate the advisability of thoroughly testing varieties of grain, vegetables, potatoes, and root crops in order to ascertain the varieties best adapted to local conditions.

Silage crops for Nevada, C. S. Knight (*Nevada Sta. Bul. 91 (1918)*, pp. 16, figs. 3).—The relative value of those silage crops deemed of most importance in Nevada, including corn, Russian sunflower, Sudan grass, wheat, millet, field peas and oats, sweet clover, alfalfa, sorghum, Russian thistle, sugar beets and mangels, and sugar-beet tops is briefly discussed and approved cultural methods outlined.

In variety tests with corn for a 4-year period Improved Leaming, with an average yield of 22,570 lbs. per acre, and Sweepstakes, 21,955 lbs., were first of 11 varieties. The highest average yields of silage from varieties of non-saccharine sorghum tested for 2 years were 21,736 lbs. for Red Kafir, 18,149 lbs. for Dwarf Black Hulled Kafir, and 18,093 lbs. for White Kafir.

Directions for filling the silo and notes on silo construction are included.

Farm practice in the production of hay in Steuben County, N. Y., and Washington County, Pa., H. B. McClure (*U. S. Dept. Agr. Bul. 641 (1918)*, pp. 16, figs. 3).—Statistical data on the amount of labor required per acre and per ton for each operation and on machinery charges per acre and per ton are presented as obtained in a detailed study of hay production made during 1915

on 52 farms in Steuben County and on 37 farms in Washington County, the methods used by hay growers being practically the same in both sections. The average size of the farms studied in Pennsylvania was 171 acres and in New York 202 acres, with a tillable area per farm in each case of approximately 156 acres. Of the tillable area in New York, 35 per cent was in hay, as compared with 26 per cent of the Pennsylvania area. The study included observations on the cost of seeding, mowing, tedding, raking, loading, hauling, and putting hay into the barn and on machinery charges, together with information procured relative to the amount of seed grown; the work accomplished per hour, per acre, and per ton; and the cost, for each locality, of baling and of hauling to market.

The total cost of production, including labor, machinery charges, interest on hay land, taxes, and seed, was estimated to average \$5 per ton for New York and \$6.10 for Pennsylvania, with average yields of about 1.5 tons per acre, while the average farm value of hay on December 1 for the 10-year period 1906 to 1915 was \$14.62 per ton for New York and \$15.14 for Pennsylvania. The amount of man labor required per ton of hay averaged 4.2 hours for the New York farms and 5.23 hours for the Pennsylvania farms. The amount of horse labor required was 4.22 hours per ton in New York and 5 hours per ton in Pennsylvania. Approximately 36 per cent of the New York hay was sold, while only 17 per cent of that produced in Pennsylvania was sold. The life of hay meadows in New York averaged 3.66 years and in Pennsylvania 4.1 years.

Permanent pastures and meadows, T. S. PARSONS (*Wyoming Sta. Rpt. 1917*, pp. 170-177).—Grass, alfalfa, and clover mixtures for irrigated pastures and meadows in Wyoming, based on field tests covering a 5-year period, are briefly discussed. Of the grasses tested, brome grass was the only one that lived through the entire period, and it proved to be sufficiently drought resistant to make a pasture on the dry farm. Tall oat grass, wheat grass, and timothy were next best in hardiness. Alfalfa mixtures gave the largest average yields, but the alfalfa crowded out the grasses to a great extent after two or three years. Brome grass used in mixtures crowded out all other grasses. Tame grass mixtures did not succeed on alkali soils, sweet clover being deemed best for such soils.

Brief notes are given on soils for grass mixtures, on seed-bed preparation, and on the irrigation of pastures and meadows.

Barley, an early maturing crop for years of feed shortage, L. C. BURNETT (*Iowa Sta. Circ. 48* (1918), pp. 4, fig. 1).—Brief directions are given for growing the crop in Iowa, and varieties deemed suited to Iowa conditions are noted.

Cotton seed for planting purposes, W. E. AYRES (*Arkansas Sta. Circ. 37* (1918), pp. 4, fig. 1).—The necessity of employing only viable seed of reliable varieties of cotton is emphasized. Data are presented showing the results of germination tests with three classes of seed in the same variety, namely, matured cotton harvested early in October, 1917, with an average germination of 90 per cent, matured cotton harvested January 27, 1918, with 43 per cent, and frosted cotton harvested the same date with 14 per cent.

Lint percentage and lint index of cotton and methods of determination, G. S. MELOY (*U. S. Dept. Agr. Bul. 644* (1918), pp. 12, fig. 2).—Simple methods for determining lint index (E. S. R., 20, p. 439), lint percentage, and weight of seeds in samples of seed cotton are outlined.

The lint index is described as the weight in grams of the fiber produced by 100 seeds and is deemed to be a measure of the abundance of the fiber rather than of the relation between the weight of fiber and weight of seed, as is the

lint percentage. The lint index may be determined by means of the following

$$\frac{\text{Weight of 100 seeds} \times \text{percentage of lint}}{\text{Percentage of seed,}} = \text{Lint Index}$$

provided a sensitive balance is available. A table is presented to facilitate finding of lint indexes of samples of seed cotton in which the weight of 100 ginned seeds lies within the limits of 6 to 16 gm. and the percentage of lint within 25 to 42. The data thus obtained are held to indicate that a larger percentage of lint may be due entirely to a decrease in the weight of the seed without a change in the amount of fiber per seed. Furthermore, the lint percentage may steadily increase as the size of the seed decreases without altering materially the actual amount of fiber obtained and, conversely, an increase in seed weight may reduce the lint percentage without an actual reduction in the amount of lint, but unless the reduction in percentage of lint is proportionate with the increase in size of seed the abundance of lint is also increased notwithstanding the reduction of the lint percentage.

The numbers of seeds and bolls per pound of fiber are computed in tabular form for different lint indexes. The data show that an increase in weight of seed of from 8.5 to 11.3 gm. per hundred, with a constant lint percentage of 33½ results in an increase of 33½ per cent of fiber and leads to a reduction of 33½ number of seeds required to produce 1 lb. of fiber of from 10,785 to 8,080, or an average of 61 bolls, representing a saving of 25 per cent in the number of bolls to be picked. Five-thousand bolls numbering 88,500 will yield one bale of cotton, all varieties having a lint index of 6, while 133,500 bolls will be required for varieties with a lint index of 4. An increase in lint percentage does not add the cost of production if the lint index remains constant.

An improved balance for the direct reading of lint percentages by the use of a standard sample of seed cotton weighing 100 gm. is described and other advantages of using such a standard sample indicated. In the absence of a sufficiently sensitive balance the number of seeds in a standard sample may be taken as an indication of their size, and the numbers of seeds in such samples calculated for various percentages of lint and weights of seed per hundred are tabulated.

The cotton grower may determine with fair accuracy the size of the seed and the lint index of the variety he plants by counting the number of seeds in 3 oz. of seed cotton (about 100 gm.) and referring to the tables in this bulletin.

Improving the oat crop. L. C. BUNSETT (*Iowa Sta. Bul.* 175 (1918), pp. 15-172, figs. 10).—Methods of increasing the yield of oats in Iowa, where they are said to occupy 32 per cent of the land sown to cereals, are described. They include the selection of adapted varieties showing consistently high yields from year to year, the use of home-grown seed, drilling in the seed at a sufficient heavy rate of seeding, the use of manure and fertilizers in the rotation, and the employment of improved cultural methods and field practices in growing the crop such as treating the seed for smut, early seeding, and proper harvesting and handling in the field.

Considerable tabulated data are presented showing the results of variety tests covering a period of several years and indicating the yields, date of maturity, height, percentage of lodging, and per-acre value for a number of varieties. The 10 leading varieties deemed suited to Iowa conditions are briefly described and include with their respective average acre yields for the period of 1907 to 1916, inclusive, Kherson with 51.7 bu., Silverplum with 47.1 bu., Green Russian with 49.9 bu., Irish Victor with 48 bu., Jonnette with 47 bu., Red Texas with 45.1 bu., White Russian with 44.5 bu., Swedish Select with 43.5 bu., Early Champion with 42.6 bu., and Clydesdale with 40.8 bu.

The use of heavy seed purchased outside the State failed to show any advantage over lightweight home-grown seed of the same variety in tests conducted at Ames for 4 years. Average yields for northern-grown, western-grown, and home-grown seed amounted to 38.79, 38.36, and 31.06 bu. per acre, respectively, as compared with corresponding yields from seed grown at Ames of 33.2, 38.68, and 35.35 bu. Observations on the effect of fanning and grading seed oats with particular reference to the accumulative effect of the treatment through successive generations indicated that larger yields were obtained from the fanned seed, but the data for the first seven generations are not deemed sufficiently consistent to attribute the increase to an accumulative effect.

Seed drilled in produced on the average 54.71 bu. per acre for the period of 1907-1916, inclusive, as compared with 49.73 bu. from broadcasting. Tests made in 1915 to determine the best distance between drill rows are said to indicate that with a seeding rate of about 3 bu. per acre 6- or 8-in. drills give higher yields than 4-in. drills.

In rate-of-seeding tests with 3 representative varieties of oats conducted during a 5-year period maximum yields were obtained as follows: Silverchue, 52 cu. per acre for a rate of 3 bu.; Kherson, 58.1 bu. for a rate of 4.5 bu.; and Iowa No. 105, 70.5 bu. for a rate of 3.5 bu.

Fertilizer tests with oats grown in a 4-year rotation for the period of 1907-1916 showed an average yield of 69.4 bu. per acre for plots receiving 8 tons of manure, 800 lbs. of steamed bonemeal, and 400 lbs. of potassium chloride during the rotation as compared with 57.11 bu. from the untreated checks. Manure alone resulted in a yield of 63.65 bu. per acre.

Improved method of fighting smut in oats. H. D. HUGHES (*Iowa Sta. Circ. 5 (1918), pp. 8, figs. 4*).—A comparison of different methods of formaldehyde treatment for the prevention of smut in oats conducted during the period of 1915-1917 is said to show "very definitely that the time and labor heretofore expended for this purpose may be greatly reduced by increasing the strength of the solution and not making the seed wet enough to necessitate drying before sowing."

Solutions were tested which contained 1 pt. of formaldehyde each to 2, 5, 10, 20, 30, and 40 gal. of water, the amount applied per bushel of grain ranging from 1 to 8 pt. Different lots of seed were also treated with the different solutions and covered for from 0 to 14 hours. Germination tests were made with each lot of treated seed and field plots seeded with treated and untreated seed. All treatments proved effective against smut in 1915, there being only 1.83 per cent smutted heads from the untreated seed. In 1916 and 1917 the treated seed showed less than 1 per cent smut while untreated seed produced 12.7 and 11.5 per cent smutted heads, respectively.

The 1:10 solution applied at the rate of 1 qt. per bushel of grain is deemed best, chiefly because the required amount of formaldehyde for a complete control of smut can be applied without wetting the seed enough to necessitate drying. In repeated trials seed sacked immediately after treatment ran through the mill 12 hours later as rapidly as untreated seed. Average yields of seed receiving various treatments and left uncovered amounted to 65.5 bu. per acre as compared with 67.5, 65.8 and 66 bu. for seed covered 4, 8, and 14 hours, respectively.

[Potato variety tests at the Sitka Station], C. C. GEORGESEN (*Alaska Stas. Rept. 1916, p. 8*).—About 50 varieties of potatoes were grown at the station during 1916, as heretofore (E. S. R., 36, p. 437), but owing to the wet season both the yields and quality were inferior to the 1915 crop. Green Mountain, Keuper, and Norway No. 1 matured seed balls during 1915. The seed was sown

in flats in May, 1916, and about 600 plants were set in the field in July. Growth is said to have been quite rapid, some of the plants reaching the blooming stage before they were dug.

Potato culture in Nevada, C. S. KNIGHT (*Nevada Sta. Bul. 90 (1918), pp. 2, figs. 19*).—This is a revised and enlarged edition of Nevada Bulletin 87 (U. S. B., 37, p. 442) containing considerable general information on potato growing deemed of special value at the present time. Information is also presented on the use of potato machinery and the general care of larger crops for the benefit of growers of tracts of 5 acres or more.

Potatoes, R. J. BARNETT, F. D. HEALD, and A. L. MELANDEE (*Washington Sta. Pop. Bul. 113 (1916), p. 1*).—A popular publication in the form of a poster outlining some factors deemed essential to successful potato growing, showing common disease and insect pests of the crop and noting methods for their control.

Soy beans in systems of farming in the cotton belt, A. G. SMITH (*U. S. Dept. Agr., Farmers' Bul. 931 (1918), pp. 23, figs. 11*).—This publication presents a description of the field practices and cultural methods employed in growing the crop in the southern States, together with a brief discussion of the importance of the soy bean in the agriculture of the cotton belt.

Grow spring wheat in Iowa, L. C. BURNETT (*Iowa Sta. Circ. 47 (1918), pp. 4*).—Brief directions for growing the crop are given with notes on varieties deemed suited to Iowa conditions.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 1 (1918), No. 7, pp. 8, figs. 2*).—A map showing the 10 divisions into which the country is divided for seed reporting work is presented and considerable tabulated data given showing the stocks on hand and total receipts by divisions of field seeds as obtained by the War Emergency Seed Survey of January 31, 1918. A similar report on stocks of vegetable and field seeds for Canada made by the seed commission of Canada is presented. Statistics are also given on the wholesale jobbing, and retail prices of the highest grade field seeds on or about March 23, 1918, for seven of the seed reporting districts. The commercial sugar beet seed situation as indicated by the War Emergency Seed Survey is briefly noted.

The usual statistics on imports of forage plant seed permitted entry into the United States during March, 1918, are presented and compared with previous receipts.

HORTICULTURE.

[Report on horticultural investigations], W. H. ALDERMAN (*West Virginia Sta. Rpt. 1915-16, pp. 38-41*).—A careful study was made of the morphology of the apple blossom, including a study of pollen viability when grown in various media ranging from distilled water to the stigmatic extract of various varieties of apples and other plants. This work has shown that an 8 per cent dextrose solution formed very good artificial media for germination and that viable pollen would germinate in a stigmatic extract of practically all varieties of apples and even on the stigma of such plants as the geranium and cucumber. Hence it appears that unfavorable germination media on the surface of the stigma is not a limiting factor in the pollination of apples. It is suggested that at least one limiting factor governing self-sterility of apples is due to inability of the pollen tube to penetrate the ovary quickly enough so that fertilization may take place before the disintegration of egg nucleus. The study was continued along this line.

A study of the more practical features of the pollination problem was made in an orchard of Rome apple trees at Grape Island. Foreign pollination by bees and also through hand pollination gave as a result a much more profuse

setting of fruit than on check trees in another part of the orchard. Hence it is concluded that the Rome variety in this orchard at least is self-sterile.

Studies on the physiological effect of pruning apple trees and on the thinning of apples have been reported in bulletin form (E. S. R., 36, p. 535; 37, p. 448, respectively). Fertilizer experiments with peaches and apples, previously reported on (E. S. R., 38, p. 41), have been continued. Lists are given of the most promising varieties to date of strawberries and bush fruits included in the station tests.

[Horticultural investigations in Alaska], C. C. GEORGESEN ET AL. (*Alaska Sta. Rpt. 1916*, pp. 6-8, 9, 10, 35-37, 48, 49, 65, 69-81, pls. 3).—A brief report on the work with fruits, vegetables, and ornamentals at the Sitka Station and at the branch stations (E. S. R., 36, p. 442), together with the usual extracts from letters from settlers and others regarding results obtained from the seed and plant distribution and other plantings (E. S. R., 36, p. 494).

Home gardening in the South. H. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 934 (1918)*, pp. 44, figs. 20).—A treatise on growing a home supply of vegetables, prepared with special reference to conditions in the South. The general principles of gardening are discussed, including the use of hotbeds and cold frames, and specific instructions are given for growing the more important vegetables. Outline maps of the United States are given which are divided into zones with a difference between them of about two weeks in the average date of the last killing frost in spring and the first killing frost in autumn. Tables are also given showing the earliest safe dates and the latest safe dates for planting vegetables in the different zones.

The farm garden in the North. J. H. BEATTIE (*U. S. Dept. Agr., Farmers' Bul. 937 (1918)*, pp. 53, figs. 23).—A treatise similar to the above on gardening in the North.

The city and suburban vegetable garden. H. M. COSOLLY (*U. S. Dept. Agr., Farmers' Bul. 936 (1918)*, pp. 52, figs. 41).—A treatise on vegetable gardening, similar to the above, prepared with special reference to city and suburban districts. In addition to cultural directions, suggestions are given for organizing garden clubs, together with labor and expense records based upon the reports from a large number of garden clubs in the District of Columbia. Data are also given showing the approximate value of different crops from city gardens.

The home vegetable garden. J. C. WHITREN (*Missouri Sta. Circ. 83 (1918)*, pp. 22).—A popular treatise on home gardening, including specific directions for growing the more common vegetables.

Home vegetable gardening from A to Z, with special reference to Pacific coast conditions. A. KETCHUM (*Garden City, N. Y.: Doubleday, Page & Co., 1918*, pp. 11+294, figs. 255).—A manual of information on the culture of the more common vegetables. Introductory pages deal with the general principles of gardening. Special reference is made to differences in cultural treatment on the Pacific coast. The text is fully illustrated from photographs of actual garden practice.

Growing plants for war gardens. C. E. DUNST (*Illinois Sta. Circ. 216 (1918)*, pp. 16, figs. 17).—This circular contains general directions for starting vegetable seed in flats and growing plants for transplanting purposes, including specific directions for handling the more common vegetables.

The right time to plant vegetables. J. W. LLOYD (*Illinois Sta. Circ. 217 (1918)*, pp. 4).—This circular contains practical suggestions relative to the proper time to plant different classes of vegetables, with special reference to Illinois conditions.

Insects and plant diseases attacking garden crops, J. H. MERRILL and L. E. MILLIGERS (*Kansas Sta. Circ.* 65 (1918), pp. 121).—A calendar for the control of insect pests and plant diseases, including formulas for making sprays, solutions for seed treatment, and other mixtures.

Growing late cabbage, E. N. REIS (*Bul. N. Y. State Veg. Growers' Assoc.*, 4 (1918), No. 3, pp. 22-25).—Practical instructions are given for growing late cabbage, and the "mature head" method of raising cabbage seed as developed by the author and his brother and followed for about 10 years is described.

Reciprocal breeding in tomatoes, R. D. HALSTED (*Jour. Heredity*, 9 (1918), No. 4, pp. 169-173).—For the purpose of studying the relative values of the two directions of the cross in reciprocal breeding, the Dandy Dwarf variety having yellow foliage, coarse leaves, and red fruits was combined both ways with the Yellow Cherry variety, a standard sort, with green foliage, fine leaves, and yellow fruit. From the records secured in the work 126 F_2 plants have been taken from each of the two sets of crosses as a basis for studying character transmission. The results are presented in tabular form and dissumed.

In conformance with the results frequently secured in plant breeding the author found that the fruits of the F_1 plants exceeded in weight and size those of the F_2 plants. Summing up the study of F_2 plants from the reciprocal crosses it appears that for the Mendelian characters the seed parent in both combinations is more potent over the offspring than the pollen parent. With characters requiring averages for an expression of results, such as weight and size of fruit, the pollen parent is the more influential.

Generally speaking, the fruits of greater weight and size are produced by dwarf plants, green-foliage plants, coarse-leaved plants, and red-fruited plants. Extracted Dandy Dwarf plants, so far as the Mendelian characters are concerned, had unusually large fruits, and extracted Yellow Cherry plants for their segregation characters had comparatively small fruits.

Spraying for profit, H. E. WEADE (*Cleveland, Ohio: Hort. Pub. Co.*, 1917, 22 ed., rev., pp. 79, figs. 38).—The present edition of this handbook has been slightly enlarged (E. S. R., 38, p. 40).

Spraying fruit trees, J. H. MERRILL (*Kansas Sta. Circ.* 66 (1918), pp. 8).—Directions for making standard sprays, including spray schedules for apple, pear, peach, cherry, and plum trees.

Cost of production of apples in the Payette Valley, Idaho, S. M. THOMSON and G. H. MILLER (*U. S. Dept. Agr. Bul.* 636 (1918), pp. 36, pls. 2, figs. 8).—This is the fifth of a series of bulletins on the cost of apple production (E. S. R., 38, p. 814). It reports a detailed study in 1915 of the current cost factors involved in the maintenance of orchards and the handling of the crop on 25 representative bearing orchards in the Payette district in western Idaho.

The more important averages brought out by this study are summarized as follows: Size of farms studied, 53.39 acres; size of bearing apple orchard, 11.33 acres; investment per farm, \$20,689.62; investment per acre of bearing apples, \$613.16; trees per acre, 63.34; annual yield per acre, 337 boxes; net labor costs, \$103.40 per acre, 30.68 cts. per box (43.14 per cent of total annual net cost of production); all other costs, \$136.25 per acre, 40.43 cts. per box (56.54 per cent of total annual net cost of production); and total annual net cost of production, 71.11 cts. per box. The total cost of production was essentially the same under clean culture and under the mulch crop system of culture. The commercial orchards of the valley are made up largely of Jonathan and Winesap apples.

The authors conclude that the stability of the agriculture on these farms is due largely to the fact that, in the main, they have been developed along

more or less diversified lines. The diversified farms are more successful than the specialized fruit ranches on the average of a series of years.

Peach varieties and their classification, H. P. GOULD (*U. S. Dept. Agr., Farmers' Bul. 918 (1918), pp. 15*).—A revision of Farmers' Bulletin 633 (*E. S. A., 32, p. 338*).

Factors in transportation of strawberries from the Ozark region, V. W. DOOLEY (*U. S. Dept. Agr., Bur. Markets Doc. 8 (1918), pp. 10, figs. 6*).—A discussion of factors involved in the transportation of strawberries, based on investigations conducted by this Department in northwestern Arkansas and southwestern Missouri in 1917 in cooperation with the railroads and leading strawberry shipping organizations. It is pointed out that the three fundamental requirements for successful shipping of strawberries are careful handling to prevent bruising and mechanical injuries, quickness of cooling after harvesting, and efficient refrigeration in transit.

Results obtained by the Department in the strawberry section of Louisiana have shown that decay in transit can be materially reduced by precooling the berries and loading into iced cars. In view of the delay to shipment caused by precooling for several hours, a successful effort was made in the present investigation to bring about rapid cooling in transit by salting the ice in the tankers immediately after loading. Both this practice and the use of false floors was found to aid materially rapid refrigeration after loading. Diagrams are given showing the results secured in experimental cars and the manner of loading for best refrigeration.

Changes in the chemical composition of grapes during ripening, F. T. BOILETT, W. V. CRESS, and H. DAVIS (*Univ. Cal. Publ. Agr. Sci., 3 (1918), No. 6, pp. 193-199, figs. 18*).—The investigations reported in this paper were undertaken during the three years 1914-1916 to determine the changes in chemical composition of Vitis varieties of grapes in California during the growing and ripening stages. Particular attention was given to increase in total solids and sugars, decrease in total acid, and changes in protein and cream of tartar in the must or juice of the grapes. The ripening of the leaves was traced by noting the changes in starch, sugar, acid, and protein content. A large number of varieties were included in the work. The methods of analyses are described and the results are presented in a series of tables and charts and fully discussed. A bibliography is given of American and European literature on the subject.

A number of factors were studied with reference to their effect upon the composition of samples taken on the same date as determined by the density and acid content of the must and juices. The authors found that young vines ripened their fruit earlier than did mature vines. Grapes located on the south side of the vine ripened more rapidly than those on the north side. Generally speaking, the bunches at the base of the cane ripened more rapidly than those near the tip, although this relation may be reversed in some instances. Variations obtained in the Balling degree of must from bunches of similar appearance and size from the same vineyard and gathered on the same day, as determined by samples of 5 lbs. each, indicate that it is difficult to select small lots of the same variety that will represent average samples. A considerable variation in composition of the berries was found to exist within the same bunch. All of the above factors, the authors conclude, must be taken into account in procuring samples.

The changes in must or grapes during growth and ripening of berries observed in the investigation as a whole are summarized as follows:

"The total solids remain fairly constant during the period of growth, corresponding to the period between setting of the berries and the time at which

the berries have reached almost full size but are still hard and green. From this point on, there is a rapid increase in total solids due to increase in sugar. After the period usually considered as full maturity is reached, the increase in total solids is slow. The question may be raised as to whether this last increase is due to an actual synthesis and secretion of sugar or other solids or simply to evaporation of water. The fact that there is no change in the curve of the acid decrease at this time indicates that the same processes are continuing and that the increased Balling degree represents an actual increase of solids. This view is fortified by observations regarding the increase of weight of solids during the ripening of raisin grapes. It has been shown that the weight of dried grapes shows a continuous increase up to the highest degree observed, 28.75 Balling.

"The total sugar during the growth period comprises only a small amount of the total solids. During ripening the sugar rapidly increases and then constitutes a much greater proportion. During ripening the sugar curve follows the total solids curve closely. It is more or less the mirror image of the total acid curve multiplied by five, i. e., increases as the acid decreases.

"During the early stages of the growth of the berries the acidity increases owing to an increase of free acid. This is a fact that the authors have not found mentioned in the literature. During ripening the total and free acid rapidly decrease. After maturity is reached the decrease is very slow.

"There is a very slow, but usually fairly definite, increase in cream of tartar during ripening. This increase is very much less than the decrease in free acid, and therefore can not account for any great part of this decrease.

"The protein not coagulated by heat increased definitely during growth and ripening, although the increase was not so regular nor so marked as the increase in sugar or the decrease in total acid."

The difference between total solids and sugar "remained constant for the lower percentages of total solids decreased during the rapid ripening stage, and remained constant through maturity and overripeness."

Olive growing in Spain, W. T. GRACKY (*U. S. Dept. Com., Spec. Cons. Rpts.*, No. 79 (1918), pp. 34).—A description of varieties grown, methods of cultivation, and the preparation of pickled olives.

The cultivated and wild citrus, A. GUILLAUMIN (*Les Citrus Cultivés et Sauvages*. Paris: Augustin Challamel, 1917, pp. 80, figs. 22).—A monograph on the wild and cultivated forms of citrus with reference to their characters, classification, and origin.

A dry blood-orange strain, A. D. SHAMEL (*Jour. Heredity*, 9 (1918), No. 4, pp. 174-177, figs. 2).—The author began a systematic study of bud variations in a commercial grove of Ruby blood oranges in the season of 1916-17. An illustrated account is here given of limb sports observed in this grove that produce juiceless oranges with straw-colored interior instead of the rich blood-like color and juicy fruit of the normal Ruby blood orange. Further studies of the trees in this orchard revealed the fact that there existed many limb sports bearing dry oranges. As a practical result of these observations fruits picked from such limbs are now excluded from the commercial pack of the orchard and all limbs of this nature, except those reserved for experimental purposes, are being removed.

Striking orange bud variations, A. D. SHAMEL (*Jour. Heredity*, 9 (1918), No. 4, pp. 189-191, figs. 2).—The author describes and illustrates some striking bud variations that have been observed for eight years on a "Thomson strain" tree of the Washington navel orange variety in one of the individual tree performance record plots near Riverside, Cal.

Reports on freeze injury to citrus trees for 1916 and 1917, with notes on orange culture in south Alabama, O. F. E. WINBERG, (I. C. STARCHER, and C. L. ISBELL (*Alabama Col. Sta. Bul. 199* (1918), pp. 3-26, pls. 7, figs. 3).—The results are given of a survey of freeze injury, chiefly to Satsuma orange and grapefruit trees in Baldwin and Mobile Counties, during freezes occurring in November, 1916, and in February and March, 1917. The data, which are presented in the form of maps and graphs and further discussed, were compiled from freeze reports on 1,360 orchards or parts of orchards containing 446,746 trees. Notes on cultural methods and varieties, together with a spray calendar for citrus fruit, are also included.

Of the total number of trees reported on 15.6 per cent of the Satsuma trees were killed outright and 8.5 per cent were killed to the bank. Twenty-eight per cent of the grapefruit trees were killed outright and 29 per cent were killed to the bank. Banking, i. e., hilling up dirt around the tree in the fall to 12 in. or higher from the ground, was practiced in about one-half of the orchards, and about 68.5 per cent of the trees which otherwise would have been damaged were saved.

The authors point out that the heavier losses from freezes in hollows and low areas as compared with losses on high areas can be largely avoided by selecting orchard sites with reference to air drainage, air currents, and freedom from windbreaks, swamps, and wind stops. "The most resistant trees to freeze were those which were most perfectly cultivated and fertilized and, therefore, most vigorous. The Satsuma is undoubtedly the most desirable of all citrus fruits for Alabama planting when considered for their commercial value and freeze resistance. A freeze which merely causes complete defoliation may not seriously affect the season's crop immediately following. Banking in most cases proved effective. Banking should be done in early November, but many orchards were saved by banking as late as January, the most damaging freeze of 1916-17 having occurred February 3, 1917. The final success of the orchard depends on proper spraying."

[Cacao experiments, 1910-1917], J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago*, 16 (1917), No. 4, pp. 176-198).—In continuation of previous reports (*E. S. R.*, 36, p. 537) this report contains a record for the period 1910-1917 of all the plants included in the manurial, shade, pruning, and natural-yield experiments carried out at the River Estate (Trinidad and Tobago Department of Agriculture) and on private estates in both Trinidad and Tobago.

No conclusions have been thus far drawn from the work as a whole. The results as recorded in the natural-yield plats for several years indicate that it will be difficult to interpret the results of experimental work on specific cacao plats unless the natural yield of the plat is recorded for several years before the experiment is started. Variations in the yield of individual trees materially affect the plat yield. Heavy-bearing trees of the first year continue to be heavy bearers and light-bearing trees continue to be light bearers, thus indicating the need of seed selection in starting plantations. At the same time the variations in yield between plats have not increased or decreased in the same proportion from year to year.

Penetration of scion by stock, G. B. PATYARDHAN (*Jour. Heredity*, 9 (1918), No. 4, pp. 187, 188, fig. 1).—A brief illustrated account of a grafted rose in which three shoots of the common stock rose developed on the scion within the area of the callus but beyond the margin of the slit.

Something about cannas and their varieties, A. C. MILLARD (*Gard. Chron. Amer.*, 22 (1918), No. 3, pp. 86, 87, figs. 3).—Several American varieties of cannas, tested in the author's garden, are here briefly described.

Observations on tulips, II, A. B. STOUT (*Jour. Hort. Soc. N. Y.*, 2 (1918), No. 16, pp. 245-247, pls. 3).—In continuation of a previous paper (E. S. R., 21, p. 836) the author here discusses the abnormal and premature development of tulips; development of buds during summer, with special regard to the occurrence of blindness; and tulip rots. The discussion is based upon observations made at the New York Botanical Garden in 1917.

FORESTRY.

Forestry and community development, S. T. DANA (*U. S. Dept. Agr. Bul.* 638 (1918), pp. 33, pls. 8).—In this bulletin the author points out some of the harmful economic and social effects of forest devastation through destructive lumbering methods, and presents suggestions relative to the development of a rational timber-land policy.

Changes in the forest area of New England in three centuries, R. M. HARPER (*Jour. Forestry*, 16 (1918), No. 4, pp. 442-452, fig. 1).—The author presents and discusses a diagram worked out by methods herein described showing the estimated percentage of forest area in each New England State from 1620 to 1910. A list of reference literature is given.

The administrative report of the Virginia State forester for the calendar years 1916 and 1917, R. C. JONES (*Admin. Rpt. Va. State Forester, 1916-17*, pp. 81).—Among activities briefly considered for the years 1916-17 are educational work, forest fire protection, progress on study of forest conditions in counties, practical assistance to landowners, establishment of a demonstration forest and forest nursery, cooperation with the Federal Government in the National defense, and cooperation with the extension service of the Virginia Polytechnic Institute. The forestry laws of Virginia through the regular session of 1916 are appended.

Report of the director of forestry for the year 1917, R. H. CAMPBELL ET AL. (*Dept. Int. Canada, Rpt. Dir. Forestry, 1917*, pp. 81, figs. 23).—The report includes a review of the several lines of work conducted by the forestry branch during the year and detailed reports of the work of the tree planting division and on the forest reserves in the separate Provinces, together with the report of the Forest Products Laboratory of Canada.

Annual report of the crown land department of the Province of New Brunswick for the year ended October 31, 1917, E. A. SMITH (*Ann. Rpt. Crown Land Dept. New Brunswick*, 57 (1917), pp. 206, pls. 29).—In addition to a detailed report on the administration, management, and finances of the crown lands of New Brunswick, reports are included on various areas surveyed in 1917 in connection with the project to make a forest survey of all the crown lands of New Brunswick.

Forestry in the Dominion of New Zealand, W. SCHLICH (*Quart. Jour. Forestry*, 12 (1918), No. 1, pp. 1-28, figs. 4).—An account of forestry in New Zealand, based largely on information taken from the Oxford Survey of the British Empire. See also a previous note by Hutchins (E. S. R., 30, p. 448).

Report on experimental forestry at the Rhodes Estate, Matopos, W. E. DOWSETT (*Rhodesia Agr. Jour.*, 15 (1918), No. 2, pp. 136-147).—Notes are given on the adaptation and use of a large number of trees that have been tested in Rhodesia.

Forest trees of Maine and how to know them, F. H. COLBY, J. M. BRISCOE, and H. N. COSSEK ([*Augusta, Me.*]: *Maine Forestry Dept.*, 1917, pp. 73, pls. 68).—In the present edition of this pocket manual (E. S. R., 21, p. 46), the text has been thoroughly revised and corrected to meet Maine conditions and several species have been added.

Native trees of Canada. B. R. MORTON and R. G. LEWIS (*Dept. Int. Canada, Forestry Branch Bul. 61 (1917), pp. 253, figs. 210*).—Descriptive accounts are given of over 100 tree species native to Canada, including in the case of the more important commercial species a brief paragraph on the physical properties and uses of the wood. Where a genus is represented by many species, their distinguishing features are arranged in tabular form. The text is accompanied by numerous illustrations of trees, bark, leaves, twigs, and fruit.

The Philippine forests. M. L. MERRITT (*Ames Forester, 5 (1917), pp. 5-12, pls. 4*).—A descriptive account of the Philippine forests with reference to their area, general composition, forest types, and estimated timber yield per acre of different types.

The forest flora of New South Wales. J. H. MANNEN (*Sydney, N. S. Wales: Govt., vol. 6 (1913-1917), pls. 1, pp. 1-15, pls. 19; 2, pp. 17-36, pls. 6; 3, pp. 37-53, pls. 9; 4, pp. 61-82, pls. 11; 5, pp. 83-115, pls. 4; 6, pp. 117-144, pls. 9; 7, pp. 145-183, pls. 11; 8, pp. 189-244, pls. 9; 9, pp. 245-268, pls. 8; 10, pp. 269-308, pls. 25; index, pp. III-XVIII*).—This is the sixth of a series of volumes on the forest flora of New South Wales (N. S. W., 30, p. 446). In the present volume 38 species are described, each species being considered with reference to its botanical characteristics, common and scientific nomenclature, size, habitat, economic products and propagation.

Intercellular canals in dicotyledonous woods. S. J. RECOMP (*Jour. Forestry, 16 (1918), No. 4, pp. 429-441, figs. 8*).—A brief synopsis is given of the various families of the dicotyledons in which intercellular canals in the wood have been observed by the author or reported by others, including information on the origin of these canals and the nature of their contents. The study was made with special reference to the importance of intercellular canals as a factor in diagnosing different woods. A list of cited literature is given.

The seeds of forest trees and their place in British forestry. W. L. TAYLOR (*Quart. Jour. Forestry, 12 (1918), No. 1, pp. 28-43*).—In this paper the author discusses the possibility of developing the forest seed industry in the British Islands, consideration being given to the following phases: Home-grown v. imported seed, source of origin, seed years, maturity and seed fall, collection, storing, extraction, testing and germination, pests, and quantities and cost.

Seed vitality as a factor in determining forest types. J. V. HOLMANN (*Ames Forester, 5 (1917), pp. 13-16, pls. 5*).—In this paper the author briefly discusses some of the reasons for nature's apparent wasteful methods in establishing forest types and points out how these facts may be utilized by the forester. Consideration is given to seed production, seed distribution, seed germinability, and seed establishment.

Forest regeneration on certain cut-over pulpwood lands in Quebec. C. D. HOWE (*Com. Conserv. Canada Rpt., 9 (1917), pp. 55-72, pls. 2; Reprint, 1918, pp. 15*).—The author gives the results of some investigations conducted in St. Maurice Valley, Quebec, under the direction of the Commission of Conservation to determine the rate of replacement of pulpwood material by growth and by reproduction on cut-over lands.

The results of the investigation show that the good yields of pulpwood material at the end of each of the several cuttings in the past 30 years do not represent the amount of growth accrued during the intervals between cutting periods, but are obtained by cutting successively smaller trees and in general low-grade material, and also by replacing a larger proportion of spruce with balsam in each cut. From the standpoint of reproduction it takes 150 years for a spruce tree to reach the minimum diameter of 12 in. established by cutting regulations in Quebec. It takes balsam about 70 years to reach the minimum cutting diameter for that species of 7 in.

A plan to frustrate the white-pine blister rust in future commercial plantings, H. A. REYNOLDS (*Mass. Forestry Assoc. Bul.* 118 (1916), pp. 2).—This plan provides for the planting of white pines and red pines in equal numbers in future plantations. The two species may be alternated in the rows or planted in alternate rows. At the time of thinning, 15 or 20 years after planting, the white pines may be taken out if infected with the rust and the red pines allowed to mature.* If the white pines are not infected the less valuable red pines may be removed.

A critical revision of the genus *Eucalyptus*, J. H. MAIDEN (*Sydney, N. S. Wales: Govt.*, vols. 2 (1910-1914), pls. 1-10, pp. XI+311, pls. 40; 3 (1914-1917), pls. 1-10, pp. 223, pls. 40).—Corresponding to the first volume of this revision (E. S. R., 23, p. 45) the present volumes contain detailed descriptions of 117 species of *Eucalyptus*, including supplementary notes relating to the description, synonyms, and economic uses of the species.

Relative frost resistance of eucalyptus in southern California, E. N. MUNNS (*Jour. Forestry*, 16 (1918), No. 4, pp. 412-428).—Tabular data are given and discussed showing the effect of the low temperatures during the freeze of January 3 to 8, 1913, on different species of eucalypts of various ages in the San Bernardino Valley. A list made up from reports by different nurserymen in the region is given showing the relative hardiness of the species in the nursery. The temperatures to which the stock was subjected ranged from 14° to 24° F.

From the observations as a whole the species are classified in the following groups: Very resistant to low temperatures, resistant to low temperatures, frost sensitive but capable of recovering from injury, and very frost sensitive.

Utilization of wood waste, C. A. KUPFER (*Ames Forester*, 5 (1917), pp. 17-21). A popular summary of recent developments in the utilization of wood waste.

DISEASES OF PLANTS.

Annual report of the Government botanist, W. SMALL (*Ann. Rpt. Dept. Agr. Uganda*, 1917, pp. 39-40).—Concluding a somewhat detailed report regarding diseases of coffee, cacao, Hevea, and other crops, the author states that Uganda is still favorably circumstanced as regards plant diseases. Problems pressing for attention are those regarding the rot and hardening of cacao pods, cacao stem canker, sterility in cacao flowers, coffee dieback, coffee broken beans, and cacao and Hevea dieback.

Report of the imperial mycologist, E. J. BUTLER (*Sci. Rpts. Agr. Research Inst. Pusa*, 1916-17, pp. 52-70).—Besides miscellaneous information, notes are given regarding ulna of rice due to *Tylenchus angustus*, tokra of Solanaceæ due to *Orobanchæ cernua* and of Cruciferae due to *O. indica*, several species of *Phytophthora* on various economic hosts, *Rhizoctonia* and other sclerotial diseases, anthracnose of chili and legumes, tikka disease of peanut, sal tree disease (*Polyporus shorea*), and peach leaf curl.

Orobanche as a parasite in Bihar, F. J. F. SHAW (*Mém. Dept. Agr. Ind. Bot. Ser.*, 9 (1917), No. 3, pp. 107-130, pls. 4, figs. 6).—Concluding a study of the tokras, which are said to be widely prevalent and injurious in Bihar, the author states that *O. indica* on mustard was not much lessened by the use of sodium nitrate. The results in case of *O. cernua* were not convincing. Weeding out the parasites before they have time to ripen seed appears to be more practicable in a region where labor is cheap. The slight climatic differences between two cold seasons may powerfully influence the development of *O. indica*. It is stated that this species contains at least two races, one parasitic on tobacco, the other on crucifers.

Rusts and smuts collected in New Mexico in 1916. P. C. STANDLEY (*Mycologia*, 10 (1918), No. 1, pp. 34-42).—Brief notes are given regarding the author's collection of Uredinales, obtained in northern New Mexico in the summer of 1916, comprising 55 species, of which 17 are thought to be new to the State.

A *Phyllachora* of the royal palm, J. R. JOHNSON and S. C. BRENER (*Mycologia*, 10 (1918), No. 1, pp. 43, 44, pl. 1).—A fungus, causing as yet only slight damage in a few cases to the royal palm (*Ropstonia regia*) near Rincón, Cuba, is described as a new species under the name *P. roystonae*.

Cultures of Uredineæ in 1915, J. C. ARTHUR (*Mycologia*, 8 (1916), No. 3, pp. 125-141).—In the fourteenth of a series of reports on Uredineæ (E. S. R., 2, p. 750), the author presents 8 species that have been previously grown in cultures and reported by himself or other investigators and 4 species the culture of which is now reported for the first time.

Cultures of Uredineæ in 1916 and 1917, J. C. ARTHUR (*Mycologia*, 9 (1917), No. 3, pp. 294-312).—Species previously reported as having been cultured include 7 for 1916 and 4 for 1917, while species reported for the first time include 2 for each year.

North American species of *Puccinia* on *Carex*, F. D. KERN (*Mycologia*, 9 (1917), No. 4, pp. 265-238).—Giving the results of studies carried on for about ten years, the author lists and describes 19 species of *Puccinia* on *Carex*, with keys, synonyms, and host lists. Species considered as new are *P. hellermanii*, *P. spatiosa*, and *P. eminens*, while new combinations proposed include *P. articulata*, *P. lysimachiata*, and *P. asterum*.

Effect of soil temperature on the growth of bean plants and on their susceptibility to a root parasite, D. REDDICK (*Amer. Jour. Bot.*, 4 (1917), No. 9, pp. 513-519).—Beans were grown at 15, 22, and 34° C. in soil contaminated with a *Fusarium* before planting. At 22° the reduction in yield by the *Fusarium* was 34 per cent; at 34°, 25.5 per cent. The growth of *Fusarium* was also observed at temperatures ranging from 12°, which was apparently above the lower limit, to 39°, which appeared to be slightly above the upper limit, the maximum growth in length appearing to occur about 31°.

Cabbage diseases, I. E. MILLER and I. H. VOGEL (*Iowa Sta. Circ.* 46 [1918], pp. 4, figs. 3).—Blackleg, black rot, club root, and yellows are described, and means of control suggested.

Broom rape on hemp, N. VAN POESTEREN (*Tijdschr. Plantenziekten*, 23 (1917), No. 1, pp. 1-16, pls. 2, fig. 1).—An account is given of observations on *Orobancha (Phelipaea) ramosa*, injuriously parasitic on hemp in the Dutch Communes of Wamel and Druten, Netherlands, where it is said to have been present for several years.

On forms of the hop (*Humulus lupulus*) resistant to mildew (*Sphaerotheca humuli*), E. S. SALMON (*Jour. Agr. Sci. [England]*, 8 (1917), No. 4, pp. 435-439).—Two seedlings of *H. lupulus* were observed in 1914 to be very resistant to mildew (*S. humuli*). Both showed a few patches of mildew in 1916. Further facts are given in this connection, particularly regarding observations made during 1916 and since on seedlings of like origin. Some of these showed absolute resistance during that year, while others of the same stock were very susceptible to mildew.

Bacterial disease of *Pisum sativum*, DOROTHY M. CAYLEY (*Jour. Agr. Sci. [England]*, 8 (1917), No. 4, pp. 461-479, pls. 4).—Further study of the disease of *P. sativum*, formerly noted (E. S. R., 2, p. 245), has established the agency in this connection of a motile sporing facultatively anaerobic bacillus which is discussed under the proposed name *Pseudomonas seminum*. A prominent characteristic of the disease is its forming a discolored area in the center of each

cotyledon. External infection takes place through young tissues only. It has been found in most portions of the plant, but not in the vessels. It develops rapidly at 25° C., but slowly at 20°. All varieties of culinary peas thus far examined are susceptible. Germination is not arrested, but in severe cases growth is retarded.

Physiological diseases of potatoes, M. F. BARRETT (*Ann. Rpt. Quebec Soc. Protec. Plants* [etc.], 9 (1916-17), pp. 45-53, figs. 3).—This is mainly a discussion of leaf roll, curly dwarf, mosaic, and streak of potato, with some observations regarding the influence of heredity and the use for seed of potatoes of inferior size and appearance. Streak appears to be infectious and bacterial in its nature.

Studies in bacteriosis.—I. Blackleg of the potato, S. G. PAINE (*Jour. Agr. Sci. [England]*, 8 (1917), No. 4, pp. 480-494).—Giving the results of a study of potato diseases, limited in the work here reported to blackleg as it occurs in Lancashire, the author states that the causal organism is *Bacillus atroscopicus*. This he claims to be in all respects identical with the organism causing the corresponding disease in Ireland, described by Pethybridge and Murphy (*E. S. R.* 25, p. 454) under the name *B. melanogènes*.

Potato mildew, A. FRATILE DE AULA (*Prog. Agr. y Pecuaria*, 23 (1917), No. 1929, pp. 314-316; 1921, pp. 326, 327).—For mildew (*Phytophthora infestans*) either Bordeaux or Burgundy mixture at 2 per cent strength is found adequate if made up to neutrality with lime or soda.

Modern methods of phytopathological research, JOHANNA WESTERBIJK (*De nieuwe wege van het phytopathologisch onderzoek*, Amsterdam; J. H. & Bussch, 1917, pp. 38).—This is mainly a review of phytopathological work recently done in different countries.

Soil temperatures as a factor in phytopathology, L. R. JONES (*Plant World* 20 (1917), No. 8, pp. 229-237, figs. 2).—Pointing out recent illustrations of the influence of soil temperatures upon plant disease, the author states that the necessity of securing constant temperatures for the study of correlation between climatic conditions and the occurrence of disease has led to the development of a plan upon which a brief preliminary report is made. By the employment of this plan temperatures ranging from 5 to 40° C. can be maintained with very small fluctuations.

Biological or physiological races of plant parasites and their economic significance, H. A. A. VAN DER LEK (*Tijdschr. Plantenziekten*, 21 (1917), Nos. 3, pp. 85-98; 4, pp. 137-164, fig. 1).—This is mainly a discussion of selected cases dealing with forms and degrees of specialization of parasites in relation with their hosts.

The beginnings and physical basis of parasitism, D. T. MACDOUGAL (*Plant World*, 20 (1917), No. 8, pp. 248-244, fig. 1).—Since 1908, experiments regarding the conditions under which a seed plant may parasitize another have been carried on at Tucson, Ariz., and reports on this work have been noted previously (*E. S. R.*, 26, p. 433). The present account refers to work done following the discovery of a cactus (*Opuntia Blakeana*) naturally parasitic on a cactus of another genus (*Carnegiea gigantea*), the physical relations with which are briefly indicated as rendering some degree of absorption possible, such limited absorption being further evidenced by the rapid growth of the parasite. A second case of undoubted and, in this instance, ancient parasitism is alluded to.

In view of the findings of Harris and Lawrence (*E. S. R.*, 38, p. 125) of inhibitional phenomena the author has modified his own view as formerly expressed that a higher osmotic pressure of its sap is a necessary condition for

parasitism by one plant on another. This is said to be further evidenced from recent work at the Desert Laboratory, supposedly proving that the parasitic penetration is not conditioned necessarily and solely by osmotic balance. The younger haustorial cells are probably not vacuolated when they enter the host, and absorption by them occurs almost wholly by imbibition, which would be carried on even against any osmotic action of a vacuolated cell. The force of expansion of the invading protoplasts would be no less important. The pressure set up would, it is thought, be sufficient to cause mechanical penetration of the host, as it would be far greater than any force attributable to osmotic action. After the haustorium is mature osmosis is probably important. The proportion of nitrogenous substance in the parasite, the acidity, and the concentration of salts might be the determining factors in both the making and the maintenance of a nutritive couple of host and parasite.

Report of the committee on fungus diseases for 1916, T. F. MANNS (*Trans. Peninsula Hort. Soc. [Del.], 30 (1917), pp. 72-76*).—As in previous reports (F. S. R., 36, p. 540), data from various sections of the country are summarized as bearing upon Delaware problems. A list of the principal diseases noted at different points in the State is included.

Insect and fungus control, E. N. CONY (*Trans. Peninsula Hort. Soc. [Del.], 30 (1917), pp. 62-71*).—The spraying and dusting calendar herein presented is in two parts, one for the general farmer, the other for the commercial fruit grower. Information is also given regarding different protective applications and apparatus for their employment.

[Plant diseases in South Africa], I. B. P. EVANS (*Union So. Africa Dept. Agr. Rpt. 1916, pp. 53-61*).—Investigations are noted as carried out or begun with an oak disease; diseases of spineless cacti; internal brown fleck and early blight (*Macrosporium solani*) of potato; leaf spot (*Septoria lycopersici*) and blossom end rot of tomato; black rot of cabbage (*Bacterium campestris*); a bacterial blight of pear blossom; bacterial spot, Phoma disease, anthracnose, and canker of citrus fruits; black spot of mangoes; a dieback of fruit trees due to *Cytospora leucostoma*; an apple cracking disease (*Coniothecium chomatoporum*); dry rot (*Diplodia zea*), kernel pinking, and leaf variegation in maize; bacterial wilt and root rot of alfalfa; and Polyporaceae, causing damage to forest trees and timber. Lists are given of related publications recently issued.

Wart disease of potatoes: Reports on the immunity trials at Ormskirk in 1915-1917 (*Jour. Bd. Agr. [London], 24 (1917), No. 8, pp. 801-818, pl. 1; Bul. Agr. and Fisheries [London], Leaflet 21 (1917), pp. 13, pl. 1*).—Wart disease, first reported in 1901, but known to have been present in some districts for many years previous, has become much more prevalent during recent years, the cultivation of susceptible varieties having greatly favored its injurious effects. Fungicidal treatment of the soil has proved useless up to this time, the fungicides effective in this connection also killing the potatoes. The results are here detailed of studies on varieties which are classed as immune, susceptible, or doubtful, and notes are given on some of the results obtained. The work is to be continued.

[Care of potatoes], LABERGE (Rec. Vit. 46 (1917), No. 1200, pp. 409, 410; 47 (1917), No. 1210, pp. 154-156).—Along with a brief statement of potato diseases due largely to unsuitable handling and storing, suggestions are given as to how losses from these causes may be lessened or prevented.

Lanas disease and its control, H. JENSEN (*Procstat. Vorstenland. Tabak [Dutch East Indies], Meded. 29 (1917), pp. 118, pls. 3*).—This number deals in some detail with the causation and transmission of lanas disease of tobacco,

said to be due to a *Phytophthora* (E. S. R., 37, p. 553). Among the measures discussed as looking to control of the trouble are Bordeaux mixture as a spray for the beds and powdered lime for the older plants.

Canning tomatoes resistant to *Fusarium*. J. B. S. NORTON (*Trans. Peninsula Hort. Soc. [Del.]*, 30 (1917), pp. 77, 78).—Giving a brief account to date of attempts previously noted (E. S. R., 32, p. 147) to develop varieties of tomato resistant or rather tolerant to *Fusarium*, the author states that in four years during which he has continued this work he has been able to select several resistant strains which have thus far shown no undesirable features, yielding a good type of fruit in good quantity on infected soil. A number of these strains have been distributed among growers to be tried out in different environments, and in relation to other tomato diseases and other drawbacks.

Crown rot of fruit trees: Histological studies. J. G. GROSSENBACKER (*Amer. Jour. Bot.*, 4 (1917), No. 8, pp. 477-512, pls. 7).—The histological studies herein briefly reported are considered when taken in connection with those previously noted (E. S. R., 36, p. 223), to indicate that crown rot and some related bark diseases are due primarily, not to the organisms usually associated therewith, but to injuries arising when adverse environmental conditions overtake trees having immature bark in certain regions, the bark rot being due chiefly to fungi which in some cases extend from severely injured bark to adjacent living portions.

Both macroscopic and microscopic examinations indicate that excessive tensions are developed during the production of the injuries. It is considered possible that in some cases the presence of metabolized foods of insufficient concentration to permit normal growth and maturation is the most significant form of immaturity. The occurrence of droughts appears to have a significant relation to the injuries. It is suggested that an adverse period in the environment occurring at such a time stops the further accumulation of the labile components of protoplasm, and a long retention of these elementary constituents, together with the enzymes which are present, may lead to catabolic processes eventually resulting in the death of the tissues involved.

Treatment of canker of foreign fruit trees. G. D'UTRA (*Bol. Agr. [Sao Paulo]*, 18, ser., No. 7 (1917), pp. 517-521).—This is chiefly a discussion of the effects of *Nectria ditissima* on fruit trees and its supposed relation to woolly aphid.

[Apple or cedar rust], H. S. JACKSON (*Trans. Ind. Hort. Soc.* 1916, pp. 56-63, figs. 5).—This includes a report, with discussion, on orchard experience with apple rust, which is said to be confined in this country to the region east of the Rocky Mountains. It is quite generally distributed throughout this area, causing serious trouble in Virginia, West Virginia, Ohio, Indiana, and Illinois.

The effect of severe infection may be noted in the decreased yield the next year or even the year after. Differences are noted in the susceptibility of varieties as to leaves or fruits independently each of the other. Spraying, while theoretically effective, is considered impracticable in general commercial orchards. Destruction of the cedars controls the trouble completely where it is thoroughly done, and this method is considered practicable where adequate cooperation can be secured. In particular cases, where ornamental or other interests are to be regarded, cutting off the galls, while expensive, is said to be effective.

Pear blight. C. A. MCCUE (*Trans. Peninsula Hort. Soc. [Del.]*, 30 (1917), pp. 51-55).—Concluding an account of experiments made or reported, the author states that spraying with Bordeaux mixture when the trees are in bloom appears to offer some protection against pear blight.

Bacterial gummosis of stone fruits. H. F. BARSS (*Mo. Bul. Com. Hort. Cal.*, 7 (1918), No. 3, pp. 121-136, figs. 11).—In a condensed account of experiences and

observations, in part reported previously (E. S. R., 32, p. 644). It is stated that during 1917 bacterial gummosis of stone fruits was very severe on portions of the Pacific coast. Trees 10 or 12 years old, or even older, showed severe injury, the disease, moreover, extending not only to cherry as usual, but also to prunes and peaches. This unusual virulence is ascribed, at least in part, to the late spring and to the long delay in growth activity, which checks the disease, also in part to the survival during the winter of insect carriers of the causal organism (*Pseudomonas* (*Bacterium*) *cerasi*).

The discussion relates to the symptoms and other features of the disease, the damage done thereby, resistance and susceptibility, and control measures, gumming itself may result from any one or more of many causes.

The organism is intercellular only. Resistance is found to differ widely with varieties.

Bacterial gummosis of apricots (preliminary report), J. T. BARNETT (Mo. Bul. Com. Hort. Cal., 7 (1918), No. 3, pp. 137-140, figs. 4).—Examination of apricot trees affected with a gumming disease revealed close agreement with the features reported in the above-noted statement by Burss. The blossom appears to be the common, if not the principal, point of entrance for the organism.

Removal of diseased bark, disinfection with corrosive sublimate (1:1,000) in 50 per cent denatured alcohol, and application of asphaltum paint apparently saved large branches, and possibly some trees. These experiments, however, are regarded as preliminary.

A new peach disease in Indiana, J. OSKAMP (Trans. Ind. Hort. Soc. 1916, pp. 430, 431, figs. 2).—A peach disease, supposed to be new and apparently due to *Bacterium pruni*, appeared in Indiana in 1915, being confined to a small area in the southern part of the State. The trouble appeared first as a leaf-bottle disease, and later attacked the fruit, the dropping of which, however, was ascribed to defoliation. While trees on poor soils or in unfavorable situations were badly attacked, those on good soil locations were almost free from infection.

The immediate action and the duration of efficacy of copper sprays, J. VAPIS (Rev. Vit., 47 (1917), No. 1220, pp. 313, 314).—As bearing upon the problem of the relative efficacy of acid and basic copper sprays (E. S. R., 36, p. 540) for treatment of grape downy mildew, the author has experimented for two years with Bordeaux and Burgundy mixtures applied to grape leaves. He has found that either preparation of either acid or alkaline reaction is efficacious from the moment of its application, but that the acid sprays leave more of the leaf surface open to infection and also lose their efficacy in a short time.

Grapevines resistant to mildew, R. SALOMON (Rev. Vit., 47 (1917), No. 1226, pp. 314-316).—This is a brief discussion of the qualities, period of bearing, etc., of a number of grape varieties said to be resistant to mildew.

Heat injury to the avocado, F. O. PORENOE (Cal. Citrogr., 3 (1917), No. 2, p. 29).—The injury done in the month of June, 1917, to avocado interests by the excessive heat is discussed. Conditions relied upon to prevent or minimize such injury are selected stock for planting, suitable shade during the first year, ample water for irrigation at the beginning of a hot period, and a mulch of straw as a safeguard against reflected heat.

Cacao diseases in Bahia, C. TORREND (Broteria, Ser. Bot. 15 (1917), No. 3, pp. 197-127, pls. 4, fig. 1).—The author discusses, among the known and more direct and important causes of loss now threatening the cacao industry in Bahia, various insects, along with the fungi *Corticium tilacinus-fuscum* on the branches, also *Phytophthora faberi* on these and on the fruits. Among the more remote influences noted are inadequate cultivation, unfavorable soil conditions, and altitude.

Control of cacao canker. C. J. J. VAN HALL (*Dept. Landb., Nijz. en Hooi*) [*Dutch East Indies*], *Meded. Lab. Plantenziekten*, No. 80 (1917), pp. 10, pl. 1.—Continuing to report on the operations against cacao canker in Kendi Pekalongan (E. S. R., 32, pp. 415, 548), the author states that cutting out the cankers and treating the wounds made thereby with 20 per cent carbolineum has given beneficial results.

During the years 1913 to 1916, the number of infections on two areas subjected to systematic treatment steadily diminished.

Notes on fungus diseases of coffee. W. J. DOWSON (*Dept. Agr. Nany.*) [*Brit. East Africa*], *Bul.* 2 (1917), pp. 44-48.—It is stated that the coffee disease due to *Hemileia vastatrix* is the only coffee leaf disease that is now of considerable importance in British East Africa, though other troubles are present, among them *Cercospora coffeicola*, *Hymenochaete noxia*, and *Capnodium brasiliense*.

Phloem necrosis of Liberia coffee in Surinam. G. STAHEL (*Meded. Dept. Landb., Suriname*), No. 12 (1917), pp. 21.—For a root disease attacking Liberia coffee during several years past in Surinam and showing some features strongly suggesting leaf roll of potato, also scorch of sugar cane, the author proposes the descriptive designation sieve tube disease (phloem necrosis).

Diplodia fruit rot, dieback, and gummosis of Citrus. S. C. BRUNER (*Agriculture [Cuba]*), 1 (1917), No. 6, pp. 17-26, fig. 1.—This is a discussion of the three forms of citrus disease caused by *D. natalensis*, of the ways in which attack by this fungus is favored, and of protective measures therefrom, including ventilation, cooling, and avoidance as far as possible of injury.

The citrus canker danger (*See African Fruit Grower*, 4 (1917), No. 2, pp. 33, 34, fig. 1).—It is stated that citrus canker is becoming increasingly serious in South Africa.

Armillaria root rot of citrus trees. J. T. BARRETT (*Cal. Citrogr.*, 3 (1917), No. 4, pp. 77, 78, figs. 2).—Cases are referred to in which infection of citrus trees by the *Armillaria* root rot was traced to diseased trees of several other genera. The results of experiments in attempting to check the spread of the fungus are given, and the causes of failure are indicated.

Diseases of orange and rose in Pernambuco. R. AVERNA-SACCÁ (*Bol. Agr. [Sao Paulo]*, 18, ser., No. 5 (1917), pp. 417-425, figs. 5).—Rose is attacked by *Phragmidium subcorticium*, *Sphaerotheca pannosa*, and *Marsonia rosea*; orange by *Trichosporium* sp., *Myriangium citri*, and *Septoria arethusa*.

A new leaf-spot disease of Polygonum persicaria. P. J. O'GARA (*Mycologia*, 9 (1917), No. 3, p. 248, pl. 1).—A new leaf spot of *P. persicaria* is reported to be due to a *Septoria* which is claimed to be new, and which is described under the name *S. persicariae*.

Cryptogamic diseases of garden plants. R. AVERNA-SACCÁ (*Bol. Agr. [Sao Paulo]*, 18, ser., 1917, Nos. 5, pp. 382-416, figs. 26; 6, pp. 486-515, figs. 24; 7, pp. 567-583, figs. 16; 8, pp. 634-654, figs. 12).—This is a discussion of diseases of garden plants according to the causal organisms, including also measures of controlling these and other injurious agencies.

Root diseases of Hevea and clean clearing. W. N. C. BELGRAVE (*Agr. Bul. Fed. Malay States*, 5 (1917), No. 8-9, pp. 318-326; *Proc. Agr. Conf. Malaya*, 1 (1917), pp. 55-63).—It is stated that since the practical accomplishment of control of root disease in the case of *Fomes*, it has been recently discovered that *Ustilium* and *Poria* are common and destructive parasites of *Hevea*. It is also stated that more recently bark cankers have caused greater concern. The fungi at present known to cause *Hevea* root diseases of Malaya are *F. lignosus* (*F. smitostus*), *Sphaerostilbe repens*, *U. zonata*, *P. hypolateritia*, and *Hymenochaete*.

Kate noria (brown root disease). These are discussed with reference to their management, which is necessarily almost wholly preventive, as the diseases are usually not discovered until the trees are past recovery. Root fungi can at be kept from entering the wounds, but the removal of jungle stumps, isolation of diseased trees by trenching, and other measures are briefly discussed.

Brown root rot [of Hevea], C. J. J. VAN HALL (*Tropismannia*, 28 (1917), 5, 6, pp. 289-295).—The author gives a descriptive discussion of brown rot (*Hymenochaete noria*) of Hevea as noted in various regions, with a list of collections relating to this disease.

Notes on effect of dyes on Endothia parasitica, CAROLINE RUMBOLD (*Bol. Inst. 6*) (1917), No. 3, pp. 259-252).—This is an account of experiments regarding the growth of the chestnut blight fungus (*E. parasitica*) in a liquid medium, fasteur's solution, to which had been added the vital stains Congo red, fuchs blue, methylene blue, and neutral red plus 7 per cent common salt, the concentration of the first three being 1:1,000, and that of the fourth being unknown. The cultures were obtained from conidia mixed with a little yeast from a test-tube culture. The results and deductions therefrom are detailed.

It is suggested that *E. parasitica* may prove to be suitable material for the study of mitochondria.

A disease of the hemlock tree due to Fomitiporia tsuginal (*Mycologia*, (1917), No. 6, p. 370).—A fungus was observed by P. Wilson at East Hebron, N. H., on a hemlock tree which was dead and prostrate in 1917. The fungus (*F. tsuginal*) was broadly effused over the trunk. Living hemlocks near Bristol were also found to be attacked by this fungus, which also occurs on hemlock in New York. The disease is considered to require further investigation.

An undescribed timber decay of pitch pine, L. O. OVERMIRE (*Mycologia*, (1917), No. 5, pp. 261-270, pls. 2).—A disease which results in a characteristic decay of sapwood in *Pinus rigida* near State College, Pa., is ascribed to *Polyozus amorpha*, which has been noted also in *P. strobus*, *P. pungens*, and *Pinus canadensis*.

Dry rot in timber, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales*, 28 (1917), 6, 7, pp. 463-466).—These notes are derived largely from an article by Groom (*E. S. R.*, 37, p. 253) previously noted.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Poisonous animals of the desert, C. T. VORHIES (*Arizona Sta. Bul.* 83 (1917), pp. 357-392, pl. 1, figs. 15).—A summary of information relating to snakes, lizards, skunks, insects, spiders, mala venado or scorpions, and myriapods.

The control of rodent pests, C. J. SOMERSON (*Utah Sta. Circ.* 29 (1918), 3-10, figs. 21).—Directions are given for the killing of ground squirrels, chipmunks, jack rabbits, and field mice.

Sixteenth supplement to the American Ornithologists' Union check list—North American birds (*Auk*, 29 (1912), No. 3, pp. 379-387).—This contains the first supplement to the third edition of the check list (*E. S. R.*, 24, 555).

Changes in the A. O. U. check list of North American birds proposed for the publication of the sixteenth supplement (*Auk*, 33 (1916), No. 4, pp. 435-441).—A summary of changes and additions proposed since the publication of the third edition of the check list (*E. S. R.*, 24, p. 555) and the sixteenth supplement noted above.

Second annual list of proposed changes in the A. O. U. check list of North American birds, H. C. OBERHOLSER (*Auk*, 34 (1917), No. 2, pp. 198-295).—This comprises further additions and changes in the names of North American birds. The first annual list of proposed additions and changes is noted above.

A cooperative bird census at Washington, D. C., H. C. OBERHOLSER (*Wilson's Bull.*, 29 (1917), No. 1, pp. 18-29; *abs. in Jour. Wash. Acad. Sci.*, 8 (1917), No. 4, p. 97).—This is a detailed report, largely in tabular form, of a bird census taken on May 12, 1913, at the height of the spring migration in the vicinity of Washington, in which the author was assisted by 15 ornithologists. The country investigated consisted of the region within 20 miles of the city and comprised the valleys of the Potomac and Anacostia Rivers, together with their tributary streams and the adjacent uplands.

The total number of species observed was 129 and the individuals actually counted 12,257. The most numerous species in the order of their abundances were English sparrow, barn swallow, tree swallow, song sparrow, chimney swift and catbird.

[Report on bird migration, April 1 to June 15, 1917, Washington, D. C. H. C. OBERHOLSER (*Bird Lore*, 19 (1917), No. 4, pp. 211, 212).

The birds of Bawean Island, Java Sea, H. C. OBERHOLSER (*Proc. U. S. Nat. Mus.*, 52 (1917), pp. 183-198).

A new subspecies of *Geothlypis beldingi*, H. C. OBERHOLSER (*Condor*, 1 (1917), No. 6, pp. 182-184).—A new subspecies, *G. beldingi goldmani*, is here described from Lower California.

Description of a new subspecies of *Perisoreus obscurus*, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash.*, 30 (1917), pp. 185-188).

A remarkable martin roost in the city of Washington, H. C. OBERHOLSER (*Bird Lore*, 19 (1917), No. 6, pp. 315-317).

The uses of insect galls, MARGARET M. FAGAN (*Amer. Nat.*, 52 (1918), 3, 614, pp. 155-176).—This is a summary of an extensive study of the literature dealing with the uses of insect galls. A list of the common names of the insect galls which have been of any practical use—53 in number—and a bibliography of 65 titles are included.

Australian Hymenoptera Chalcidoidea, I-III.—Supplements, A. A. GIRAULT (*Mém. Queensland Mus.*, 2 (1913), pp. 101-139; 3 (1915), pp. 142-179).—In the supplements here given to the papers previously noted (E. S. R., 28, p. 563) additions have been made to the families Trichogrammatidae (vols. 2, pp. 104-106; 3, pp. 142-153), Mymaridae (vols. 2, pp. 107-129; 3, pp. 154-169), and Eulimnidae (vols. 2, pp. 130-139; 3, pp. 170-179), which include descriptions of new genera and new species. A general supplement has been previously noted (E. S. R., 37, p. 855).

Australian Hymenoptera Chalcidoidea, IV-XIV, A. A. GIRAULT (*Mém. Queensland Mus.*, 2 (1913), pp. 140-334; 3 (1915), pp. 180-346; 4 (1915), pp. 365).—In continuation of the papers previously noted (E. S. R., 28, p. 563), descriptions of new genera and new species are given of the families Eulophidae (vols. 2, pp. 140-296; 3, pp. 180-299), Perilampidae (vols. 2, pp. 297-302; 3, pp. 300-312), Pteromalidae (vols. 2, pp. 303-334; 3, pp. 313-316); and of the families Encyrtidae (pp. 1-184), Mischocyttarusidae (pp. 185-202), Cleonimidae (pp. 203-224), Eucharidae (pp. 225-237), Eurytomidae (pp. 238-274), Callinimidae (pp. 275-309), Agonidae (pp. 310-313), and Chalcididae (pp. 314-365) in volume 4.

On the larval and pupal stages of *Bibio johannis*, H. M. MORRIS (*Jour. Appl. Biol.*, 4 (1917), No. 3, pp. 91-114, pl. 1, figs. 12).—The studies here reported were conducted with larvae of *B. johannis* taken from the soil of a permanent pasture in Cheshire. While several members of the family Bibionidae

are of economic importance, the author has found this species to feed upon decaying vegetable matter only.

The Mediterranean fruit fly, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr. Bul. 640 (1918), pp. 43, figs. 33*).—An abridgment of Bulletin 536 (*E. S. R.*, 35, p. 658).

The melon fly, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr. Bul. 643 (1918), pp. 31, figs. 23*).—An abridgment of Bulletin 491 (*E. S. R.*, 37, p. 566).

The Argentine ant in relation to citrus groves, J. R. HORTON (*U. S. Dept. Agr. Bul. 647 (1918), pp. 73, pls. 6*).—This is a report of investigations of the Argentine ant (*Iridomyrmex humilis*) which occurs in citrus groves in Louisiana and in California, in the latter State being especially numerous in parts of the citrus districts of Los Angeles and Riverside Counties. A general account of its distribution and control in the United States by Barber has been previously noted (*E. S. R.*, 35, p. 761).

The author finds that the principal cause of the decline of orange trees and loss of crop in southern Louisiana, which has been largely blamed on the Argentine ant, is in reality due to cultural neglect. The only direct injury done by the ant is to destroy a negligible number of orange blossoms. The ants do not attend the armored scales of citrus or secure honeydew from them, nor do they disseminate the living scales, but they do disturb the predatory enemies of these scales, preventing the destruction of as large a proportion of them as would otherwise occur. It is pointed out that the natural enemies of the armored scales do not prevent heavy infestation even in orchards free from ants and that the ant can not prevent the control of the armored scales in Louisiana by spraying, nor will it increase the cost of spraying. Destruction of the ants will not control these scales and they must be controlled if orange growing in Louisiana is to be made profitable.

"Under present conditions the Argentine ant does not cause exceptionally severe infestations in the orange groves of Louisiana, even of those soft scales to which it is most favorable. The mealy bugs have not been of importance as an orange pest in ant-invaded orchards during the years 1913 to 1915, partly due to the effectiveness of natural enemies, especially certain internal parasites, partly to overcrowding of the trees by armored scales and white flies, and partly because of the poor physical condition of the trees.

"In Los Angeles County, Cal., where the trees are kept free from other scales and vigorously growing, the mealy bugs increase tremendously as a result of ant attendance. Ordinarily they are kept under complete control, where the ants do not occur, by their predatory enemies. In orchards where fumigation has been neglected and the trees become overcrowded with the black scale, the mealy bug does not benefit so much from ant attendance, and infestation is much heavier."

The Argentine ant may be an active agent in the spread of diseases through its habit of visiting various parts of the tree, and particularly freshly made wounds, for the purpose of feeding, gummosis and wood-rotting fungi being introduced in this way more rapidly than would otherwise be the case. It may act as a conveyor of diseases of bacterial origin, such as the citrus canker, by carrying the causal organisms about on its legs and body.

If ants are deterred by barrier ditches from entering the groves rapidly, five or six fumigations of the box traps devised, about a month apart, should reduce the worst infestations that annoyance from them will cease, and fumigation thereafter of a few of the traps once in every three to six months will suffice to prevent further molestation. "The estimated cost of reducing the ants from most extreme numbers to the few remaining where

there is effective control would be about \$6.03 per acre for labor and fumigant, or not to exceed \$16.03, including the first cost of traps and covers. It is believed that large sections of territory where the annual rainfall is heavy could be effectively and economically freed from ants by this method if the members of the community would cooperate in the undertaking. Although the labor of ant destruction might be somewhat prolonged in cities because of the numerous buildings and other suitable nesting places, this method, it is believed, might be advantageously adapted to city use.

"Destruction of the ants in Louisiana orange groves will not effecting control the armored scales, or the white flies and the rust mite, and would not pay for itself in actual crop increase. Regardless of the ants many run-down orange groves in Louisiana can be so improved by one season's thorough spraying and cultural treatment as almost to double their production. The success of certain orchards in southern Louisiana demonstrates that orange can be profitably grown there if the trees are carefully selected and planted and the best known cultural practices and methods of insect control followed.

Control of the Argentine ant in orange groves, J. R. HOWARD (*U. S. Dep. Agr., Farmers' Bul.* 928 (1918), pp. 29, figs. 6).—This is a summary of information on control measures, based upon the investigations above noted.

In Louisiana orange groves this pest can be controlled as an orchard ant, house pest by the trapping method, while in California orange groves the ants can be prevented from getting into the trees by banding the trees and the numbers can be reduced by poisoning.

The black cacao ant (*Dolichoderus bituberculatus*) and its importance in cacao culture in Java, P. VAN DER GOOR (*Meded. Proefstat. Midden-Java*; No. 25 (1917), pp. 142, pls. 4, figs. 4; also in *Rev. Appl. Ent., Ser. A*, 5 (1917), No. 12, pp. 570-574).—A report of studies of the morphology and biology of this ant is followed by accounts of its relation with *Helopeltis*, the cacao mealy bug (*Acerococcus cacomella*), the cacao mealy bug (*Pseudococcus crotonis*), etc. Studies of the cacao mealy bug and its natural enemies (pp. 90-114) and statistical data are appended.

The investigations have shown this ant to be an aid in protecting cacao trees against *Helopeltis*, both directly by preventing oviposition thereon as through the disturbance of *Helopeltis* by *P. crotonis*, which the ant attacks. It also protects cacao to a considerable extent against the cacao moth, the other great pest of cacao in Java.

Notes in regard to bots, *Gastrophilus* spp., M. C. HALL (*Jour. Amer. Vet. Med. Assoc.*, 52 (1917), No. 2, pp. 177-184).—"Carbon bisulphid, in experimental test followed by post-mortem examination, is as highly effective against bots as clinical findings indicate. Neither chloroform nor oil of chenopodium are of any value in removing bots, so far as our experiments show; this bears out the clinical findings for chloroform and conforms to the probabilities for oil of chenopodium.

"*Gastrophilus intestinalis* (*G. equi*) is capable of incidental myiasis in dogs when well-developed larvae from the stomach of the horse are fed to them, but *G. nasalis* and *G. hemorrhoidalis* seem to have only a limited capacity for adaptation to conditions in the dog."

Reference is made to the investigations of Roubaud (*E. S. R.*, 38 p. 53) which indicate that the bot larva escapes from the egg when the horse bites and rubs his skin with his mouth and burrows into the buccal mucosa before proceeding to the stomach.

Note recording the proof that *Anopheles maculipennis* is an efficient host of the benign tertian malaria parasite in England, S. P. JAMES (*Jour. Roy. Army Med. Corps*, 23 (1917), No. 5, p. 615).—The author records the findings

zygotes in different stages of development in two of six specimens of *A. albopictus* which had fed on a benign tertian gamete carrier between August 1 and September 15 and which were dissected on September 17.

A note on the period during which the eggs of *Stegomyia fasciata* (*Aedes albopictus*) from Sierra Leone stock retain their vitality in a humid temperature. A. BACOT (*Parasitology*, 10 (1918), No. 2, pp. 280-283).—The author records the emergence of a single larva from a batch of 4,000 eggs upon being immersed 13 months after oviposition. Twenty adults were reared from some 2,000 to 3,000 eggs stored for 15 months.

Mosquito growth in catch basins. J. W. M. BUNKER (*Incr. Jour. Pub. Health*, 7 (1917), No. 11, pp. 956-959).—The author's investigations have led to the following conclusions:

"Under ordinary conditions catch basins can and do serve as breeding places for mosquitoes. Depending on the season, mosquitoes may be expected to breed in catch basins in places of the same climatic conditions as Cambridge, Mass., from May to September. A sufficient amount of rainfall serves to wash out the basins to some degree and rid them of eggs and larvæ. This need be only on the occasion of precipitation if it be brisk. It is evident that oiling is efficient in reducing the number of mosquitoes coming from this source, and it appears that in some cases oiling of the streets to keep down the dust serves automatically to oil the catch basins."

Effective methods of fly control, T. J. HEADLEE (*Sci. Amer. Supp.*, 85 (1918), No. 1941, pp. 159, 151).—A paper read before the New Jersey Sanitary Association.

A further contribution on the biology of *Hypoderma lineatum*, S. HADWEN (*Canada Dept. Agr., Health Anim. Branch Bul.* 21 (1916), pp. 10, pls. 5).—A more extended account than that previously noted (*E. S. R.*, 37, p. 691) which has been summarized by the author as follows:

"*H. lineatum* may be captured out-of-doors as early as April 15 in exceptional years, but since it has been proved to withstand low temperatures it has probably been overlooked in other seasons, both at home and abroad. On two occasions it was captured in the absence of sunshine. Oviposition takes place principally when the animals are lying down. The longest time for the eggs to hatch on the cattle was seven days.

"Larvæ were made to penetrate pieces of skin, which had been removed from cattle. They crawled down the hairs and entered by way of the follicles. A single larva was found penetrating the skin of a cow under natural conditions. The larvæ which had penetrated the skin were squeezed out. Serious skin lesions were caused by the penetration of the larvæ for which the name 'hypodermal rash' is proposed. The principal skin lesions were found from the point of the ischium to the hock, on the top part of the udder; from the point of the ischium to the patella, slightly on the flanks and abundantly on the sternum behind the elbow. The damage done to the hide by the larvæ entering is confined to the poorer parts of the leather, but the injury caused by the entrance of pus organisms and others may produce fatal diseases, such as charnax and blackleg."

Observations on the migration of warble larvæ through the tissues, S. HADWEN and E. A. BRUCE (*Canada Dept. Agr., Health Anim. Branch Bul.* 22 (1916), pp. 14, figs. 7).—The authors have verified by observations the following facts on the course of the larvæ in the host:

"The larvæ are found in the submucosa of the esophagus and gradually work their way toward the diaphragmatic end of the esophagus. They may follow the posterior borders of the ribs under the pleura. They may enter the udder;

canal. Evidences that the posterior foramen is the means of ingress and egress have been noted."

In summarizing it is pointed out that the following points have been established: "The larvae follow connective tissue closely. In British Columbia they may perforate the skin of the back as early as December 15. The latest date on which larvae were found in the gullet was March 15. Larvae found in the esophagus, spinal canal, and subcutaneous tissue, all had about the same dimensions; signs of their migration through the intervening tissue were also found, proving that the process is continuous."

Habits of mosquitoes of the genus *Anopheles*, which transmit malarial fever in Panama, and their control in the interior, J. ZETEK (*Bol. La Salle [Panama]*, 3 (1917), No. 32, pp. 10-13; 3 (1918), Nos. 33, pp. 8-12; 34, pp. 3-7).—In the first part of this paper the author deals with the classification and habits of the *Anopheles*, giving tables for the separation of both adults and larvae; in the second part with antimalarial work in Cuba and the Canal Zone; and in part 3 with sanitation in the interior of Panama.

Experiments with a parasitic fungus of the cacao thrips, F. WATTS (*Dep. Agr. West Indies. Rpt. Agr. Dept. Grenada, 1916-17*, pp. 11, 12).—Experiments in the parasitism of the cacao thrips by *Sporotrichum globuliferum* are briefly reported. Observations of this fungus in St. Vincent have been previously noted (E. S. R., 36, p. 153; 37, p. 461). See also another note (E. S. R., 38, p. 57).

Serious injury to the vine in Bengazi by a thysanopteran (*Dictyophara ægyptiacus*), H. V. ZANON (*Agr. Colon. [Italy]*, 11 (1917), No. 6, pp. 33-35, pls. 2).—This is a brief account of *D. ægyptiacus*, which is a source of injury to the grape in Bengazi.

The black cherry aphid, W. A. ROSS (*Agr. Gaz. Canada*, 5 (1918), No. 1, pp. 13-16, figs. 5).—This is a brief report of experimental work at the Vineland Station, Ontario, with *Myzus cerasi*, where in 1915 it was very destructive to the sweet cherry.

The discovery was made that the aphids migrate in summer to wild pepper grass (*Lepidium apetalum*) where they establish colonies of wingless females and return in early autumn. It is pointed out that the pest is most vulnerable during the spring just before the buds break, at which time all the eggs are hatched and the young stem mothers feeding on the buds are without protection. Thorough spraying with blackleaf 40 at this time will destroy practically all the aphids.

Second report on the experiments carried out at Pusa to improve the mulberry silk industry, compiled under the direction of the imperial entomologist, M. N. DE (*Agr. Research Inst. Pusa Bul.* 74 (1917), pp. 271-275).—This is a report of further experiments with the silkworm (E. S. R., 34, p. 529). In which success has been attained in establishing multivoltine hybrid races which will yield better cocoons than the pure multivoltine races generally reared in Bengal, Assam, and Mysore.

The maize stalk borer (*Calamistis fusca*), R. W. JACK (*Rhodesia A. Jour.*, 14 (1917), No. 6, pp. 707-717, pls. 2, fig. 1).—A report of biological studies of this pest and means for its control in Rhodesia. While the intensity of attack varies considerably from year to year it is at times a source of very serious injury.

Cutworms.—How can they be controlled? J. W. SCOTT (*Wyoming Sta. Rpt.* 1917, pp. 162-164).—Directions are given for the control of cutworms.

Machines for the treatment of cotton seed against pink bollworm (*G. lechii*) *Pectinophora gossypiella*, G. STORKE (*Min. Agr. Egypt, Tech. and S. Serv., Bul.* 14 (1917), pp. 29).—The general principles of two classes of machines

invented for the treatment of the cotton seed for the destruction of the pink bollworm are described: (1) Those in which the destruction is brought about by fumigation, and (2) those which depend upon heat for their efficiency.

The orange Tortrix, cause of decay. H. J. QUAYLE (*Cal. Citrogr.*, 3 (1918), No. 6, p. 133, figs. 2).—A brief account of a lepidopteran which was responsible for losses in some groves in 1917, in the vicinity of Pasadena and Altamira, to the extent of from 20 to 25 per cent.

Control of New Zealand flax grubs. D. MILLER (*Jour. Agr. [New Zeal.]*, 15 (1917), No. 6, pp. 303-306, figs. 4).—Further investigations (E. S. R., 38, p. 257) of the control of New Zealand flax grubs (*Xanthorhoe praelectata* and *Melanchra steropastis*) have led to the discovery of an ichneumonid parasite, which is the most important parasitic enemy of *X. praelectata*. The larva of this grub is also attacked by a larger ichneumon wasp and by *Syrphus ortos*.

M. steropastis, which attacks the edge of the flax leaf and not the lower surface as does *X. praelectata*, is attacked by a tachinid parasite (*Phorocera marginata*).

Keep this bug out. G. G. BECKER (*Arkansas Sta. Circ.* 55, pp. 4, figs. 7).—A brief account of the sweet potato weevil (*Cylas formicarius*), which has not yet been recorded from Arkansas, in which the importance of preventing its introduction and establishment in the State is emphasized.

The white pine weevil and its relation to second-growth white pine. S. A. HAMAM (*Jour. Forestry*, 16 (1918), No. 2, pp. 192-202, figs. 6).—This is a report of investigations at the Minnesota Experiment Station of *Pissodes borei*, which injures young white pines, Norway spruce, and to a lesser extent Scotch pine, by killing the terminal shoots.

"The eggs are deposited during the spring and early summer in the inner bark of the terminal shoots, and the larvae work their way downward beneath the bark, girdling the shoot. They pupate in cells in the pith or beneath the bark, emerge as adults during August and September, and hibernate in the litter beneath the trees. The weevil is distributed throughout the range of the white pine, but the infestation is heaviest in the Eastern States. Young trees between the ages of 5 and 30 years are subject to attack. The weevil prefers thickly, rapidly growing trees in the open. Generally speaking, the denser the stand the lighter the weevil injury.

"The most economical and effective method of controlling the weevil in forest plantations is by close planting, although other effective measures have been suggested for ornamental plantings or small plantations. Parasites and predaceous enemies of the weevil help to keep it in check, although they can never be depended upon for the complete control of this pest. At present the white pine weevil is not a serious pest in Minnesota, although it may become so in the future, but in the Northeastern States it is worthy of serious consideration."

Damage to barley in Sweden in 1916 by the wheat midge. H. TEDÉN (*Gergröns Tidskr.*, 27 (1917), No. 1, pp. 31-32).—It is stated that in plot tests of 15 different strains of barley, *Contarinia tritici*, first noticed on two-rowed barley in Sweden in 1912, was responsible for losses in 1916 of from 4.3 to 33.2 per cent of the crop.

Summary of locust work for the fourth quarter, 1916. F. W. SOUTH (*Agr. Bul. Fed. Malay States*, 6 (1917), No. 1, pp. 21-30).—This is a summary of locust work carried on in continuation of that previously noted (E. S. R., 37, p. 849).

Insect pests of the coconut palm in Malaya. R. M. RICHARDS (*Proc. Agr. Conf. Malaya*, 1 (1917), pp. 69-74).—The pests briefly considered are the brown, black, or rhinoceros beetle (*Oryctes rhinoceros*), the leaf beetle *Xylo-*

trapez gideon, the palm weevil or red beetle (*Rhynchophorus ferrugineus*), leaf-eating beetle of the family Hispidie (*Brontispa froggatti*), two hesperid butterflies (*Hidari iraca* and *Eriopota thraez*), *Thosca cinereomarginata*, *Eg. hasua* sp., *Bruchartona calozantha*, *Termes gestroi*, etc. See also a previous note (E. S. R., 38, p. 460).

[Insect pests in Anglo-Egyptian Sudan], H. H. KING (Wellcome Trop. Research Lab.) *Ent. Bul.*, 1917, Nos. 4, pp. 7; 5, pp. 6; 6, pp. 8; 7, pp. 4. These brief popular accounts deal, respectively, with The Pink Bollworm (*Ag. lekina*) *Pectinophora gossypiella* in the Anglo-Egyptian Sudan, whither it was introduced prior to 1913, but has as yet become a pest in but two localities; The Pink Bollworm and Measures for Its Control; The Sudan Cotton Bollworm (*Hiparopsis castanea*), which probably occurs throughout Africa; and The Weed Handbuk (*Abutilon* spp.) and Its Relation to the Cotton Growing Industry in the Anglo-Egyptian Sudan. Two or more species of *Abutilon* occur in the cotton-growing districts of the Sudan and serve as food for four of the major insect pests of cotton, namely, the Egyptian bollworm (*Earias insulana*), the cotton flea-beetle (*Nisotra uniformis*), the Egyptian cotton stainer (*Oxydemus hyalinipennis*), and the pink bollworm.

Destruction of agricultural pests [in Cyprus], W. BEVAN (*Dept. Agr. [Cyprus] Ann. Rpt. 1916-17, pp. 12-14*).—Among the more important pests of the year against which control measures were directed mention is made of the vine worm (*Zygaena oenophaga*), which was a source of serious damage to the Mediterranean fruit fly (*Ceratitis capitata*); a carob pest (*Cecidomyia caryotomic*); and a wheat pest (*Oecophora temperatella*).

Common garden insects. R. L. WEBSTER (*Iowa Sta. Circ. 44 (1918), pp. 1-4, figs. 9*).—A popular summary of information on several of the more important garden insects.

Two important vegetable pests, W. H. BRITAIN (*Col. Agr., Truro. V. S. Circ. 26 (1917), pp. 7, figs. 7*).—A brief account is given of the potato tuber borer (*Gortyna micacea*), which attacks the potato, corn, rhubarb, sugar beets, etc., having been introduced from Europe several years ago; and the zebra caterpillar, which stripped the leaves from whole fields of turnips, etc.

Spraying for the control of insects and mites attacking citrus trees in Florida, W. W. YORBERS (*U. S. Dept. Agr., Farmers' Bul. 933 (1918), pp. 1-10, figs. 24*).—In the present publication the author gives information in regard to the best equipment for Florida conditions and directions for preparing effective home-made insecticides, together with a spraying schedule which has proved satisfactory after four years of practical experience. It is pointed out that under Florida conditions spraying is the most effective method for the control of citrus pests. The spraying schedule recommended includes the use of paraffin-oil emulsions (Government formula), containing 1 per cent of oil, in May; lime-sulphur solution, 32° B. (1:50 to 1:75), June to July; paraffin-oil emulsions (Government formula), containing 1 per cent of oil, August 25 to October 31; and lime-sulphur solution 32° (1:50 to 1:75), November to December.

Some reasons for spraying to control insect and mite enemies of citrus trees in Florida, W. W. YORBERS (*U. S. Dept. Agr. Bul. 645 (1918), pp. 1-10*).—After calling attention to the fact that many who were previously opposed to spraying for the control of citrus insects are now adopting this measure, the author considers at some length data relating to injury by insects to trees and fruit, particularly the loss caused through the lowering of the grade of fruit including reduction in size and quality. A brief account is then given of the spraying scheme for controlling citrus pests, as presented in the publication.

have noted, together with data on the cost of spraying and the profits and benefits resulting. Of the total damage caused by insects and mites to citrus in Florida more than 95 per cent is due to six species, namely the citrus white fly, the purple scale, the rust mite, the red scale, the cloudy-winged white fly, and the red spider.

The data presented in this bulletin led the author to estimate that had the 1915-16 crop of oranges and grapefruit been sprayed according to the schedule recommended the growers of Florida would have increased their net returns by \$1,288,955. "There is no reason why the standard percentage of fruit in the higher grades can not be raised so that the percentage in the first, second, and third grades will be 35, 50, and 15 instead of, as at present, 13, 41, and 46. In one of several instances given, spraying increased the amount of fruit in the first and second grades from 24.6 to 94.9 per cent and reduced that in the third and fourth from 75.4 to 5 per cent; increased the amount in the first from 0.6 to 27.4 per cent and reduced that in the fourth from 16.4 per cent to zero."

Fumigation of citrus trees, R. S. WOGLUM (*U. S. Dept. Agr., Farmers' Bul.* 123 (1918), pp. 39, figs. 17).—A general account of approved methods of fumigating citrus trees with hydrocyanic acid gas for the control of scale insects and white flies, based in part upon investigations previously noted (*U. S. R.*, 25, p. 363).

Liquid hydrocyanic acid, H. J. QUAYLE (*Cal. Citrogr.*, 3 (1917), No. 2, pp. 23, figs. 3).—This is an account of the methods used in making liquid hydrocyanic acid for citrus fumigation in California.

Poisoning by hydrocyanic acid gas, A. M. McINTOSH (*Med. Jour. Aust.* [1917], April 28; *abs. in Jour. Trop. Med. and Hyg.* [London], 20 (1917), No. 1; pp. 167, 168).—This reports upon a case of accidental poisoning during the course of fumigation work with hydrocyanic acid gas.

Insects and rodents injurious to stored products, E. N. CORY and H. S. McINNES (*Id. Agr. Ext. Serv. Bul.* 8 (1917), pp. 123-144, figs. 17).—A popular summary of information.

Control of insects affecting stored seed and food products, G. G. DECKER (*Arkansas Sta. Circ.* 33, pp. 3, figs. 12).—A popular summary of information.

Two experiments in house fumigation, H. MAXWELL-LEFROY (*Ann. Appl. Biol.*, 4 (1917), No. 3, pp. 115-118).—In fumigation experiments in a house infested with the house mite (*Glyciphagus domesticus*) the author demonstrated that cyanid and carbon bisulphid can be used together, that the escaping vapors are not offensive to neighboring houses, that neither gas damages the contents of a house, and that a single application at the rate of 1 lb. of cyanid to 500 cu. ft. and 1 lb. of bisulphid to 500 cu. ft. of space may be sufficient to destroy practically all of the mites. The hydrocyanic acid gas probably never penetrated the floors and the bisulphid did not saturate above the floor level.

In the second experiment a two-story house of 18,000 cu. ft. capacity infested with book lice (*Psocidae*) which was fumigated with 12 lbs. of tetrachlorethane and 12 lbs. of 130 per cent sodium cyanid was completely cleared of the insect.

Bloodsucking insects as transmitters of anthrax or charbon, H. MORRIS (*Louisiana Sta. Bul.* 163 (1918), pp. 3-15, figs. 2).—This is a report of experimental work carried on in the pathological laboratory for the past three years with the horn fly (*Hamatobia irritans*), horsefly (*Tabanus* sp. near *nigrovittatus*), and two mosquitoes (*Psorophora (Janthinasona) sayi* and *Aedes sylvestris*), which has shown all four to be capable of transmitting anthrax by feeding upon a healthy animal after sucking blood from an infected one. The results indicate that anthrax bacilli when ingested from the blood of a sick animal are mostly, if not entirely, destroyed in the digestive tracts of these insects.

In the experiments conducted, horn flies which fed upon infected guinea pigs as long as four hours before death transmitted the disease to healthy pigs from 2 of 17 bitten (11 per cent) and in one instance the disease was transmitted by horn flies that had fed upon an infected carcass 15 minutes after death. The greatest number of transmissions took place when horn flies fed upon the diseased animal shortly before its death. Horn flies which fed upon infected sheep 30 minutes before death and others 15 minutes before, at, and 15 minutes after death transmitted the disease to guinea pigs. The disease was conveyed from 16 per cent of the animals bitten by horseflies infected 6, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 hours before death and five minutes after death, respectively. Other horseflies fed within this period gave higher percentages, and the disease was transmitted by all of six flies which sucked blood at the time of death of the animal. It is stated that the large black horsefly *T. atratus* sometimes feeds upon carcasses 30 minutes or more after death and that virulent cultures of anthrax were obtained from the bodies of this fly, but it could not be induced to feed in captivity. The disease was transmitted by mosquitoes from 16 per cent of the infected animals fed upon three hours before death and 12 per cent of those fed upon 10 minutes after death.

Cultures were made of 1,218 "specks" from the horn fly and 11 produced colonies of anthrax, all being from those cultured within six hours after feeding upon an infected host. Two colonies were found in 318 specks from the horsefly, and one colony in 711 specks from mosquitoes. No attempt was made to feed anthrax spores to determine whether they pass through the digestive tract.

Report of the parasitologist, J. W. SCOTT (*Wyoming Sta. Rpt. 1917, pp. 151-155*).—This is a brief statement of the work of the year, which relates to the transmission of swamp fever in horses in continuation of the work previously noted (E. S. R., 37, p. 374), the life cycle of *Tania (Moniezia) capensis*, the life cycle of *Thysanotoma actinoides*, the life history of *Sarcocystis tendii*, and screen wire cloth durability tests.

Additional proof that swamp fever may be transmitted by the stable fly was secured and it was found that the virus may be transmitted by puncturing with an infected hypodermic needle. "A horse may contract the disease from bites of flies and for months show very little fever and few symptoms of the disease and still carry virulent blood. Apparent immunity to the disease may be developed and at the same time the horse may be a carrier of the virus. In subinjections the amount of blood used in a rough way bears an inverse relation to the length of the incubation period. This confirms findings of the Japanese Commission. The decrease in the total hemoglobin content of the blood is approximately proportional to the decrease in the number of red corpuscles. An attempt was made to transmit the disease by means of *Tabanus*. The results were doubtful in the one horse used in this experiment."

Report of the proceedings of the second entomological meeting, held at Pusa February 5 to 12, 1917, edited by T. B. FLETCHER (*Rpt. Proc. Ent. Meeting Pusa, 1917, pp. XII+340, pls. 35*).—This report of the meeting held at Pusa is prepared in such a way as to be an abstract of the present knowledge of Indian crop pests.

The predacious mite *Hemisarcoptes malus* and its relation to the natural control of the oyster-shell scale, *Lepidosaphes ulmi*, J. D. TORRELL (*Ag. Gaz. Canada, 5 (1918), No. 3, pp. 234-239, figs. 3*).—A brief summary of information on this mite, which has been found quite regularly distributed, and when the oyster-shell scale is abundant, the most important single factor operating toward the control of the scale in eastern Canada. In places where the host is less abundant the mite becomes proportionately less efficient.

Classification of the Hæmosporidia, C. FRANÇA (*Jour. Sci. Mat., Fis. e Nat., s. ser., No. 1* (1917), pp. 41, figs. 29; *abs. in Trop. Vet. Bul.*, 5 (1917), No. 4, pp. 231-237).—This is a revision of the classification of the Hæmosporidia.

FOODS—HUMAN NUTRITION.

Food chemistry in the service of human nutrition, H. C. SHERMAN (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 5, pp. 333-390).—The question of the combination of adequacy of nutrition with the economic use of food from the conservation standpoint is discussed in detail. Excerpts from the article follow:

An adequate diet must provide a sufficient amount of digestible organic nutrients to yield the necessary number of calories. "The maintenance of an optimum degree of fatness (which as Symonds has shown is very near the average of healthy Americans) is usually the best evidence that the energy value of the diet is well adjusted to the needs of the individual. 'Counting the calories' in the food eaten is not necessary as a means of establishing the adequacy of the customary food intake if this is already established by the obvious condition of nutrition of the individual concerned, but if there be any question of prescribing the food—of rationing either an individual or a community—then adequate energy value of the ration is the first thing which should be considered, for only when the energy supply is adequate can the 'tissue-building' constituents of the body and of the food be conserved to the best advantage."

The material requisite of an adequate diet must furnish proteins in ample amount and of suitable sorts. "... It seems abundantly liberal to allow, when planning for an economic use of food, a protein 'standard' 50 per cent higher than the average estimate of the actual requirement (which, as already shown, is probably an overestimate). Such a 50 per cent margin for safety would lead to a tentative standard allowance of about 75 gm. of protein per man per day. The requirements of children for protein as well as other tissue-building material will be considered as proportional to their energy requirements and therefore much higher per unit of weight than in the case of adults."

The adequate diet must supply adequate amounts and proper proportions of the ash constituents, salts, or inorganic foodstuffs. As a result of dietary studies it is very strongly indicated that the average American dietary contain a much more liberal margin of protein than of either phosphorus or calcium and that while the danger of a protein deficiency is rarely serious, the danger of a deficiency of phosphorus or calcium is more important. "Phosphorus deficiencies are plainly more frequent than are deficiencies of protein, and calcium deficiencies are more frequent still. The old assumption that adequate protein may be taken as meaning adequate supplies of all tissue-building material is found to be wholly misleading."

The actual requirements for iron may average about 0.10 gm. and the corresponding standard be placed at 0.015 gm. per man per day. On this basis it would appear that the danger of a deficient intake of iron on freely chosen diet is much less than in the case of calcium but much greater than is the danger of a deficiency of protein.

The adequate diet furnishes enough of these as yet unidentified substances, the food hormones or so-called vitamins. The vitamin requirement can not be stated in terms of actual weight of fat-soluble A and water-soluble B, but the percentages of certain foods rich in the one or the other of these essentials which suffice to make an otherwise satisfactory diet adequate for normal growth and reproduction have been determined experimentally for several foods by

Oshorne and Mendel and by McCollum, and his associates, so that the relative richness of several types of food in each of these dietary essentials is known. In a general way and the factor of food value, in considering the problem, which should be given to each type of food in planning an adequate and economical diet, can be taken into account. "It is very interesting and important to find how generally the types of food rich in calcium—milk, eggs, vegetables—are rich in vitamins as well, so that in safeguarding against deficiency of the element most likely to be deficient. . . . at the same time . . . an ample intake of the food hormones or vitamins [is secured.]"

The adequate diet must include a sufficient amount of material of such physical character as to insure the proper handling of the food mass and its residence in the digestive tract. In applying the knowledge of nutritive requirements in the choice of food the author states that the average American diet can be modified to meet all the wishes of the Food Administration and be materially improved at the same time. He points out that the duty placed upon the United States by the present food emergency to eat less meat and more of perishables, as milk, vegetables, and fruit, is what the recent advances in the knowledge of food and nutrition have shown to be for the best health in every case. "A good general rule for families of any level of income, a standard of living is to spend at least as much for milk as for meat, and to spend at least as much for vegetables and fruit as for meats and fish."

In regard to substitutes for wheat the author states that, "to the extent that the saving of white wheat flour means an increased use of the cereals, flours and of oatmeal and potatoes in bread making (or potatoes in place of white bread), this also will result in an improvement in the mineral and vitamin content of the diet. To the extent that wheat flour is replaced by oatmeal, we may anticipate no appreciable gain or loss in nutritive value."

The food habits of [the Armenians]—a people without nerves, H. C. TAYLOR (*Amer. Cookery*, 22 (1918), No. 9, pp. 614-616).—The author attributes the Armenians' ability to stand the strain of city life without loss of constitution to their same food habits. Their diet is deemed well-balanced, the food wholesome, well cooked, and well seasoned. Their liberal use of matzo (bread of fresh vegetables) is specially noted. Some recipes for vegetable meat combinations often served by Armenians are given.

The nutritive value of the soy bean, AMY L. DANIELS and NELL B. NICHOLS (*Jour. Biol. Chem.*, 32 (1917), No. 1, pp. 91-102, figs. 6).—Chemical analyses of soy beans and data from biological tests are recorded in this paper.

The authors conclude that the soy bean is one of the most valuable of the leguminous seeds. "It contains a high percentage of a physiologically good protein, a considerable amount of energy-yielding material in the form of fat and carbohydrate, and a fairly liberal supply of the fat-soluble food accessories as well as of the water-soluble growth determinant."

"In order to make the soy bean a more nearly complete food, suitable as a guide material, consisting principally of sodium chlorid and calcium compounds, needs to be added."

A physical and chemical study of the Kafir kernel, G. L. BOWELL (*U. S. Dept. Agr. Bul.* 634 (1918), pp. 5, fig. 1).—Chemical analyses of the Kafir corn kernel and its parts are reported and a comparison made with maize.

According to the author, the results obtained show that corresponding parts of the Kafir corn and maize kernels resemble each other in composition and appearance, and lead to the belief that if Kafir corn were handled in a manner similar to that used in the preparation of maize products, Kafir corn products might be substituted for the corresponding maize products.

How to grow the tomato and 115 ways to prepare it for the table, G. W. CUMER (*Alabama Tuskegee Sta. Bul. 36* (1918), pp. 391). Methods of cultivation are described, also remedies for diseases and insect pests. Recipes are included.

The commercial freezing and storing of fish, E. D. CLARK, L. H. ARMY, and M[ARY] E. PENNINGTON (*U. S. Dept. Agr. Bul. 635* (1918), pp. 9, figs. 8).—The process and effect of freezing and storing on fish, as carried on under commercial conditions, are discussed.

"Freezing and freezer storage will hold fish for many months in the condition in which they were received, but will not repair deterioration due to previous heating or mishandling. Freezers should accept only fish that are in prime condition. Unless delivered within three or four hours after being taken from the water, fish should be kept under refrigeration in the boats. Rapid freezing at as low temperature as possible is necessary in many plants in order to insure a good product and to handle receipts as they arrive. Glazing by enclosing the fish in an envelope of ice prevents loss of moisture, protects the fish from molds and bacteria, and makes them less subject to mechanical injury. Fish to be stored for more than three to five months should be glazed occasionally, as in time the glaze evaporates, even at low temperatures.

"The most economical temperature for storing fish is probably at some constant temperature between 0° and +10° F., although some freezers hold that lower temperatures tend to delay evaporation of the glaze. Boxing fish before freezing helps to prevent loss of glaze and protects the product from mechanical injury. Properly frozen fish reach the retailer in excellent condition. He should keep them hard frozen until they are sold. The practice of thawing fish by warming or in water greatly lessen their food value and flavor. Chemical analyses show no significant changes in fish held 27 months, or for a period much longer than would be necessary or profitable in storing fish commercially."

The influence of cold shock in the sterilization of canned foods, L. D. BURNHAM (*Jour. Indus. and Engin. Chem.*, 10 (1918), No. 6, pp. 445-446).—Thirteen series of experiments were made to determine the influence of various procedures used in canning vegetables to insure sterilization, including (1) the effect of heating to boiling temperature for 5-20 minutes and suddenly cooling by plunging into ice water; (2) the effect of intermittent heating followed by cold shock; (3) the necessity for complete sterilization; and (4) the result of hermetically sealing. Peas, string beans, beets, and green corn were used and a series of control experiments was made with cultures from spoiled canned foods. The conclusions reached by the author were as follows:

"Blanching is of no value in reducing the time necessary to properly process canned foods. Small amounts of salt are of little value in preventing the growth of bacteria in canned foods.

"Small amounts of organic acid (acetic acid) have a distinctly retarding action upon the growth of bacteria in canned vegetables. The use of small amounts should be advocated in all cases in which it will not injure the texture, flavor, or appearance of the product.

"In many cases an unsterile product will keep indefinitely if properly sealed. This, however, is not true in all cases, and sealing should not be expected to take the place of proper processing because of the danger of loss due to spore-forming bacteria."

Farm home conveniences, MADGE J. REESE (*U. S. Dept. Agr., Farmers' Bul. 126* (1918), pp. 32, figs. 25).—The household conveniences described in this publication have been selected because they may be made at a moderate cost

by anybody who has a few simple tools and the ability to use them, and are based on the extension work in home economics of this Department. The descriptions include a kitchen cabinet, fireless cooker, sponge box or bread raising dish drainer, blocks for raising tables, serving tray, folding ironing board and rack, iceless refrigerator, cold box, equipment for making butter and cheese, shower bath, a simple water-supply system (by R. W. Trullinger), fly trap, cook-stove drier or evaporator, cleaning closet, etc.

ANIMAL PRODUCTION.

Studies on the composition and nutritive value of clover hay and clover silage in Montana. E. BURKE, G. E. SMITH, and M. J. BLAIR (*Montana Sta. Bul. 117 (1917), pp. 57-72*).—The investigation here reported, which is a continuation of work already noted (*E. S. R.*, 31, p. 673), involved analyses of a considerable number of samples of freshly cut red clover and of the silage made from the same clover, the object being to study the chemical changes which occur when clover is put in the silo. The results are compared with the work of other experiment stations. The digestibility of clover hay and clover silage was also determined in experiments with steers.

In reference to the changes which occur during the ensiling of clover it is noted that a considerable loss in dry matter occurs during the ensiling process. Although the fresh clover contained 4.68 per cent of reducing sugars, there was no trace of any in the silage. There was an increase in the nonprotein nitrogenous compounds and a corresponding decrease in true protein. There was a gain in ether extract which is attributed to the formation of organic acids developed during the fermentation of the carbohydrates. No significant change was noted in the mineral constituents and only a slight increase in the percentage of crude fiber.

A comparison of freshly cut clover, clover hay, and clover silage showed a lower protein content for the clover hay than for the silage or the freshly cut clover. The nitrogen-free extract was higher in the clover hay, but there was slight losses in ash, fiber, and ether extract. Some loss in nonprotein nitrogenous compounds occurred during the curing of clover as hay, but these compounds were increased during the ensiling of clover. The calorific value was highest in the silage and lowest in the freshly cut clover.

In the digestion experiments with 2-year-old Hereford and Shorthorn steers the following results were obtained:

Coefficients of digestibility of clover silage, clover hay, and timothy hay with steers.

Ration.	Dry matter.	Crude protein.	True protein.	Ether extract.	Crude fiber.	Ash.	Nitrogen-free extract.	Cal.
	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
Clover silage, 1912-13.....	66.77	70.24	51.13	78.53	52.31	48.85	79.09	61.4
Clover silage, 1914-15.....	63.90	65.32	52.13	77.99	39.45	43.65	71.87	61.4
Clover hay, 1914-15.....	66.20	67.39	63.27	61.31	49.48	49.96	76.81	64.7
Timothy hay, 1912-13.....	57.87	53.89	43.00	64.89	56.44	39.53	63.29	54.7

Relative feeding value of crops of alfalfa (*Nevada Sta. Rpt. 1917, pp. 57-58*).—A chemical investigation was made of over 100 samples of alfalfa from different parts of the State in the attempt to explain the purported differences in feeding value of the separate crops or cuttings. It was found that a definite

ation exists between the ash and nitrogen content of the different crops of alfalfa. Averaging all the analyses the percentages of ash were as follows: first crop, 8.07; second crop, 7.75; third crop, 8.32; and fourth crop, 9.37. The corresponding percentages for nitrogen were 2.4, 2.27, 2.61, and 3.18. On the assumption that the feeding value of the crop lies in its ash and nitrogen content it is concluded that the fourth crop should be the best feeding material, the third the next, then the first, and lastly the second crop. It is stated that this order has virtually been established by the farmers of the State in their feeding practices.

Composition and digestibility of feeding stuffs grown in Hawaii, M. O. OLINSON and KIM AK CHING (*Hawaii Sta. Press Bul. 53* (1918), pp. 261).—All the analyses of Hawaiian feeding stuffs that have been made by the station are tabulated and arranged in form convenient for comparison with standard tables of American feeding stuffs. A table is also given showing the estimated digestibility and nutritive ratios of the various feeds. In making up this table it has been assumed that the average digestibility of Hawaiian feeding stuffs is approximately the same as that of similar American feeding stuffs.

Commercial feeding stuffs, W. J. JONES, JR., E. G. PROFF, C. CUTLER, R. B. DENNIS, and J. H. ROOP (*Indiana Sta. Bul. 269* (1917), pp. 3-342).—In addition to notes on the objects, provisions, and administration of the State feeding stuffs law, a table compiled from various sources showing the average digestion coefficients of feeding stuffs, and definitions and descriptions of feeds, the results are tabulated and summarized of the inspection during 1916 of 1877 samples of feeding stuffs representing 2,017 brands and 851 manufacturers. Complete analyses, representing in many cases only 1 sample, but in the majority of instances composites of from 2 to 228 samples, of the following feeding stuffs are tabulated: Wheat bran, wheat middlings, red dog flour, low-grade flour, ground rye, rye middlings, oat middlings, ground cowpeas, alfalfa meal, animal by-products, dried beet pulp, coconut oil meal, ground corn, corn bran, corn red dog flour, gluten meal, gluten feed, branley feed, cottonseed feed, cottonseed meal, brewers' and distillers' dried grains, malt sprouts, vinegar grains, linseed meal, unscreened flaxseed oil feed, barley refuse, cracked barley, and miscellaneous mixed and proprietary feeds. Other tables show the details of inspection, the results of microscopic examination of samples, shipments removed from sale, and feeding stuffs registered for sale during 1917-18.

Indiana feeding stuffs control, E. G. PROFF (*Indiana Sta. Circ. 72* (1917), pp. 6).—A résumé of Bulletin 269, noted above, explaining the feeding-stuffs law and its enforcement, but not reporting analyses.

A method of calculating economical balanced rations, J. C. RUNDLES (*U. S. Dep. Agr., Bul. 637* (1918), pp. 18).—The methods herein described are based upon the principle of diligation. By means of a series of tables of values the following may be readily estimated: The excess protein or nitrogenous foods used in specified nutritive ratios, the protein deficiencies of carbohydrate foods in specified nutritive ratios, the corresponding values of grains per bushel and per 100 lbs., and the relative cost per pound of the digestible protein and digestible carbohydrates of various feeds.

Computing rations for farm animals, E. S. SAVAGE (*New York Cornell Sta. Bul. 241, 1st. ed.* (1916), pp. 3-68, *figs. 4*).—This is a revised and enlarged edition of this bulletin (E. S. R., 28, p. 364), to which are appended tables showing the composition of feeding stuffs and modified Wolff-Lehmann feeding standards for farm animals, compiled mainly from Feeds and Feeding by Bailey and Morrison (E. S. R., 34, p. 261), the digestible composition of stated

amounts of common feeding stuffs, the cost of 100 lbs. of total digestible nutrients in different feeds at varying prices, and the fertilizing constituents per ton of feeding stuffs as returned in the manure of dairy cows.

[Animal husbandry work in Alaska], C. C. GEORGESON, J. W. NEAL, and M. D. SNOBGARSS (*Alaska Sta. Rpt. 1916*, pp. 12-15, 49, 50, 58-62, pl. 1). Experiments with Galloway cattle at the Kodiak Station have shown that the breed is well adapted to the climate. The most undesirable feature of the breed for Alaska conditions is the poor milking qualities of the cows. Experiments are being made to overcome this difficulty by crossbreeding with Holstein-Friesians. A serious prevalence of tuberculosis was discovered in the herd during the summer of 1916 and an attempt is being made to free the herd of this disease by the Bang method. Notes are given on the management of cattle under the conditions that obtain at the Kodiak Station.

The Kodiak Station flock of sheep was wintered at Kalsin Bay on a ration of hay and silage. Beginning March 25 the pregnant ewes were fed, in addition to hay and silage, rolled barley, cracked corn, and linseed meal (2:2:1). The flock wintered in fair condition, and 11 of the 14 lambs were saved. The spring clip of 1916 averaged 7.5 lbs. of wool of fair quality per head. Attention is again called to the menace of the brown bear to the sheep industry in this locality.

At the Fairbanks Station it is estimated that at present prices for feed the feed cost of raising a colt to four years old is \$680. Experiences of farmers in the vicinity are noted, indicating the unprofitableness of hog raising in the interior of Alaska. The station herd of hogs was received in 1914 and consisted of four yearlings and two 2-year-old hogs. Since then sales have amounted to \$912.88, and the present herd consists of three old hogs and five pigs from the 1916 litters. The feed cost of the herd during this period is amounted to \$2,081.31.

[Feeding experiments with beef cattle], E. W. SHEETS (*West Virginia Sta. Rpt. 1915-16*, pp. 23-26).—In investigations as to the best and most economical rations for wintering beef cattle, during the winter of 1914-15, 32 yearling steers were fed 140 days at the station in four lots, lots 1 and 3 being in open shed and 2 and 4 in open lots. Lots 1 and 2, on timothy hay, gained 0.25 and 0.12 lb., respectively, per head daily, at a total feed cost of \$18.31 per head. Lot 3, on clover hay and corn silage, gained an average of 0.3 lb. per head daily, at a total feed cost of \$13.71. Lot 4, on 0.85 lb. of cottonseed meal, supplementing wheat straw and silage, lost 0.25 lb. per head daily, the total feed cost being \$10.68. The following summer the steers in these lots on pasture for 128 days made gains of 298, 320, 296, and 334 lbs. per head, respectively. The experiment was continued during the winter of 1915-16, 32 head calves being fed for 147 days in four lots. In this test lots 1 and 3 were in open shed and 2 and 4 in open lots. Lot 1, on a ration of timothy hay, corn silage, and 0.54 lb. of cottonseed meal, gained an average of 0.26 lb. per head daily, at a total feed cost of \$10.86 per head. Lot 2, on rye hay, corn silage, and 0.59 lb. of cottonseed meal, gained 0.13 lb. per head daily, at a feed cost of \$10.29. Lot 3, on clover hay and corn silage, gained 0.27 lb. per head daily, at a feed cost of \$9.89. Lot 4, on timothy hay and a grain mixture of corn bran, and linseed meal (3:1:1), gained 0.3 lb. per head daily at a feed cost of \$14.88 per head.

At Lewisburg in the winter of 1914-15, 3 lots of 10 yearling steers each were fed for 128 days in open sheds with the following results: Lot 1, on timothy hay or corn stover, corn silage, and wheat straw, lost 0.25 lb.; lot 2, on corn silage, wheat straw, and 1 lb. of cottonseed meal, gained 0.57 lb.; lot 3,

roughly hay or corn stover and wheat straw, lost 0.56 lb. The following winter these steers on pasture for 168 days gained a total of 336, 255, and 245 lbs. per steer for the respective lots. The experiment was repeated in the fall of 1915-16. In this test the steers in lot 1, on corn silage, mixed hay, and wheat straw, exactly maintained their weight for 122 days. During the same period lot 2 gained an average of 0.66 lb. per head daily on silage, wheat straw, and 1 lb. of cottonseed meal, and lot 3 lost 0.06 lb. per head daily on mixed hay and wheat straw. The following summer these lots gained in 28 days on pasture an average of 41, 6, and 28 lbs. per head, respectively.

In the fall of 1915 a cooperative experiment on the cost of raising beef cattle in the State was started at Lewishurg. Thirty cows and heifers of the two principal beef breeds were bred to drop calves during the winter and spring. They were fed in three lots for 122 days with the following results: lot 1, on corn silage, mixed hay, and wheat straw, lost an average of 0.25 lb. per head daily; lot 2, on corn silage, wheat straw, and 1.5 lbs. cottonseed meal, gained 0.52 lb.; and lot 3, on mixed hay, wheat straw, and 15 lbs. of shelled corn, gained 0.60 lb. per head daily.

(Pasture survey of West Virginia), I. S. Cook (*West Virginia Sta. Rpt.* 25: 16, p. 16).—In a pasture survey of the State 216 farmers were interviewed in six representative grazing counties. With these farmers the average net estimated per acre was about 126 lbs. for a yearling steer, 84.5 lbs. for a 2-year-old, and 69.4 lbs. for a 3-year-old, or a general average of 93.3 lbs. per season. With beef at 7 cts. per pound, this gain gives an average acre return of \$4.56 for land. From this it is concluded, with land worth \$34.45 per acre, that three dollars an acre may be expended for pasture improvement.

Five years' calf-feeding work in Alabama and Mississippi, W. F. WARD and S. S. JERDAN (*U. S. Dept. Agr. Bul.* 631 (1918), pp. 53).—The experiments reported are a continuation of those already noted (*E. S. R.*, 27, pp. 372, 673). The first part of the present bulletin deals with the profitableness of raising and marketing calves for the market by the time they are a year old, and southern tests and combinations of feeds that may be used for fattening calves during the winter months. In the first experiment three lots of high-grade calves from 6 to 8 months old, averaging 376 lbs. in weight, were fed at Sumterville, Ala., for 197 days, beginning November 17, 1911. Lot 1, 16 calves, were fed cottonseed meal, cottonseed hulls, and mixed alfalfa and Johnson grass hay; lot 2, 15 calves, cottonseed meal and corn-and-cob meal (2:1), cottonseed hulls, and mixed alfalfa hay; lot 3, 16 calves, the same ration as lot 2, except that the cottonseed meal and corn-and-cob meal were mixed in the proportion of 1:2. The calves were confined in half-acre paddocks and had access to open sheds. The average daily gains per head for the calves were 1.94 lbs. for lot 1, 1.75 for lot 2, and 1.59 for lot 3. At current prices for feeds the feed costs per pound of gain in the different lots were 5.14, 5.72, and 6.43 cts., respectively. With an initial value of 4 cts. a pound for the calves and a selling price of 55 cts. a pound on the farm, after a 3 per cent deduction on farm weights, the profits per calf averaged \$5.46, \$4.90, and \$4.07 for the respective lots. In this experiment pigs were allowed to follow lots 2 and 3. In addition to the indigestible corn from the droppings the pigs were fed shelled corn. The pigs in lot 2 gained 805 lbs. on 3,715 lbs. of corn; and those in lot 3, 659 lbs. on 2,970 lbs. of corn. When the profits from the pigs were added the profits on the calves were increased to \$4.97 in lot 2, and to \$4.78 in lot 3.

During the winter of 1912-13, in the same shelter and lots that were used in the above test, 46 calves from 6 to 8 months old, averaging 371 lbs. each, were fed from November 29 to March 3, as follows: Lot 1, cottonseed meal and cor-

tonseed hulls; lot 2, cottonseed meal and corn chop (2:1), cottonseed hulls and corn silage; and lot 3, cottonseed meal, cottonseed hulls, and corn silage. On March 3 the calves were thrown into one lot and fed cottonseed meal, corn chop, cottonseed hulls, and mixed hay until April 29. During the silage period the average gains were 1.49, 1.23, and 1.49 lbs. per head daily for lots 1, 2, and 3, respectively. The feed cost per pound of gain in this period was 5.59 cts. for lot 1; 6.09 cts. for lot 2; and 5.13 cts. for lot 3. During the 58 days following the silage period the calves gained 1.09 lbs. per head daily at a feed cost of 11.31 cts. per pound of gain.

In 1914 the cooperative cattle feeding work was transferred to Mississippi and the tests were continued under farm conditions at Abbott, in the tickling section of the black prairie belt. For 143 days, beginning November 13, 4 calves, averaging 400 lbs. each, were fed in three lots in open barns. The calves in each lot were fed a ration of 5.5 lbs. of cottonseed hulls, 3.5 lbs. of alfalfa hay, and all the silage they wanted. In addition, lot 1 received cottonseed meal; lot 2, cottonseed meal and corn-and-cob meal (2:1); and lot 3, cottonseed meal and corn-and-cob meal (1:2). The average daily gains per head were 1.71, 1.87, and 1.59 lbs. for lots 1, 2, and 3, respectively. At the prevailing feed prices for the year the feed cost per pound of gain was 6.34 cts. for lots 1 and 2, and 7.4 cts. for lot 3.

In the winter of 1915-16 on the above-mentioned farm in Mississippi the lots of 7- to 8-month-old calves that had just been weaned were fed for 156 days on a concrete floor under shelter. The calves were fed about 4.5 lbs. of alfalfa hay per head daily and all the silage they wanted, and in addition lot 1 consumed daily per head 3.69 lbs. of cottonseed meal, lot 2, 1.49 lbs. of cottonseed meal and 6.01 lbs. of shelled corn, and lot 3, 8.78 lbs. of shelled corn. The average daily gains per head were 1.74, 1.7, and 1.8 lbs. for the three lots. The calves in lot 1 were inclined to grow and did not fatten so rapidly as those in the other two lots. These calves were valued at 5 cts. per pound at the beginning of the test, and at the close they were shipped to St. Louis and sold for 8.17, 8.58, and 8.66 cts. per pound for the respective lots. Each lot made very satisfactory profits. During the 156-day period there was saved for each calf in lot 1 29.16 lbs. of manure daily, 26.17 lbs. from lot 2 and 21.20 lbs. from lot 3. No bedding was used, and the manure was scraped up and weighed daily. Some of the liquid manure was lost.

In order to determine the best method of preparing for market calves that are dropped too late in the spring and summer to be profitably fed during the following winter, a number of such calves were allowed to nurse their dams during the winter of 1915 and were weaned in the spring and fed on pasture for fall market. In addition to pasture, the calves were fed cottonseed cake and a mixture of cottonseed cake and shelled corn. The summer of 1916 was unusually dry, and consequently the pastures were very poor. The calves in lot 1 were fed 1 lb. of cottonseed cake per head daily at the beginning. This was increased to 3 lbs. at the end of the second 28-day period and to a maximum of 4.5 lbs. at the end of the third period, which amount was fed the rest of the summer. Lot 2 was started on 0.5 lb. of cottonseed cake and 1 lb. of corn per head daily. This was doubled by the end of the second 28-day period and by the end of the third period they were getting 3 lbs. of cottonseed cake and 6 lbs. of shelled corn, which amount was fed until the end of the grazing period. The average daily gain per head during the 179 days was 1.41 lbs. for lot 1 and 1.63 lbs. for lot 2. These calves were placed in dry lot on October 3 and continued on the same grain rations with corn silage for roughage. For the 67-day finishing period the average daily gains per head were 1.49 lbs. for

of 1 and 1.52 lbs. for lot 2. The corn-fed calves were fatter and had a higher (about 2) percentage in slaughter tests than the cottonseed meal calves. Eight calves which followed the calves in lot 2 from November 7, 1916, to January 5, 1917 with no feed other than what they picked up behind the calves, gained 50 lbs. in weight, or almost 1 lb. per head daily. With feeds at current prices, fage at \$3 per ton, and pasture at 50 cts. per calf per 28-day period, and selling the calves at 5 cts. per pound at the beginning of the test and 8.05 cts. for lot 1 and 8.48 cts. for lot 2 at the close at St. Louis, there was a profit of 10 cts. per calf for lot 1 and \$9.64 per calf, not including pork, for lot 2.

The bulletin closes with a general discussion of the results of the entire five years' experiments.

Digestion experiments with sheep. J. B. LINDSEY, C. L. BEALS, and P. H. SMITH (*Massachusetts Sta. Bul. 181 (1917), pp. 241-335*).—Digestion experiments made since the autumn of 1912 are reported. In the majority of experiments the basal ration was English hay or English hay and gluten feed, and in nearly all the tests the experimental period extended over 14 days, the first 3 of which were preliminary. The complete data for the experiments are tabulated, including analyses of the feeding stuffs used.

A summary of the results is given below:

Coefficients of digestibility obtained with sheep.

Ration.	Number of single trials.	Dry matter.	Ash.	Protein.	Fiber.	Nitrogen-extract.	Fat.
		<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
English hay.....	4	57.74	43.61	71.78	46.40	65.12	23.82
English hay and gluten feed.....	2	87.92	56.97	86.13	91.03	95.18	69.72
English hay and gluten feed.....	2	97.83	77.29	76.54	112.27	102.32	42.67
English hay and gluten feed.....	2	74.12	44.97	61.50	78.23	84.34	37.39
English hay and gluten feed.....	8	109.93	64.40	89.05	129.47	104.75	114.66
English hay and gluten feed.....	5	80.39	43.77	75.92	85.15	65.53	65.53
English hay and gluten feed.....	4	66.54	36.31	77.07	44.44	67.38	83.70
English hay and gluten feed.....	23	79.47	36.31	49.78	64.10	62.35	46.34
English hay and gluten feed.....	11	66.59	33.25	66.39	67.75	69.91	51.89
English hay and gluten feed.....	6	73.27	20.16	72.98	63.54	80.67	37.16
English hay and gluten feed.....	5	58.06	43.09	44.09	62.00	61.09	45.00
English hay and gluten feed.....	2	75.51	.....	59.67	.....	87.76	58.70
English hay and gluten feed.....	16	81.35	132.38	83.44	132.41	93.77	64.41
English hay and gluten feed.....	6	86.00	.....	55.00	100.00	83.00	.....
English hay and gluten feed.....	4	87.07	30.58	50.84	95.54	94.76	.....
English hay and gluten feed.....	3	79.22	73.64	37.69	131.30	89.60	123.50
English hay and gluten feed.....	2	69.14	44.49	69.37	22.32	83.71	138.33
English hay and gluten feed.....	7	80.69	65.40	76.61	61.05	88.89	91.60
English hay and gluten feed.....	2	101.54	82.31	93.26	116.34	105.72	92.63
English hay and gluten feed.....	2	69.99	34.40	60.33	68.10	63.47	32.27
English hay and gluten feed.....	2	56.65	20.44	79.88	52.56	59.73	59.31
English hay and gluten feed.....	2	70.57	26.03	79.69	50.19	70.91	81.48
English hay and gluten feed.....	4	69.64	47.30	72.42	75.56	68.50	72.54
English hay and gluten feed.....	3	57.49	50.11	57.96	68.19	50.98	28.66
English hay and gluten feed.....	4	69.45	48.45	78.07	57.76	68.76	51.19
English hay and gluten feed.....	2	88.98	53.36	75.62	81.65	96.06	68.38
English hay and gluten feed.....	8	88.33	78.42	18.47	85.52	93.84	49.18
English hay and gluten feed.....	4	60.79	.....	64.42	58.10	55.97	82.57

[Range carrying capacity and methods of handling sheep on ranges] *Colorado Sta. Rpt. 1917, pp. 75-77, figs. 5*.—Carrying capacity tests on summer grazing ranges indicate that the average acreage per sheep per 100 days, counting two lambs equal to one ewe, is 1.82 acres. These observations were made where the range plants were mostly grasses and woods with a scattering growth of brush.

The rapid destruction and disappearance of the white sage (*Eurotia lanata*) on ranges, due to improper winter grazing methods, are noted. In feeding experiments with sheep in which cottonseed cake was used as a supplement on white sage winter range, the use of a concentrate under such conditions proved profitable and desirable. Cottonseed cake prevented losses due to sore mouth and starvation during storms. The digestion system of the sheep was kept in excellent condition, the ewes were in good condition at lambing time, and yearlings and 2-year-olds were kept in good growth.

With eight flocks of sheep, five of which were herded under the old existing method of returning to a permanent bed ground each night and three flocks allowed to bed where night overtook them and to graze at all times as quietly and openly as possible, the results showed a saving of from 10 to 20 per cent in the acreage of range required, depending upon the efficiency of the herder, and an increase of from 4 to 7.5 lbs. in the weight of the lambs under the new system.

The place of sheep on New England farms, F. H. BRANCH (*U. S. Dep. Agr., Farmers' Bul. 929 (1918), pp. 29, figs. 6*).—The purpose of this publication is to show (1) the relative importance of the industry and the place that sheep now occupy on New England farms, (2) the returns from sheep as compared with dairy cattle, and (3) the more important difficulties experienced by sheep growers and the practices followed in handling these troubles. The estimated number of all sheep in New England on January 1, 1918, was 360,000, where the number of sheep, exclusive of lambs, in the region in 1850 was approximately 2,257,000.

From a study of conditions on a large number of farms in Maine, New Hampshire, and Vermont in 1915, it was found that each sheep sheared an average of 6.5 lbs. of wool, and 75 lambs were raised for every 100 ewes kept. With wool at 22 cts. and lambs at 6.5 cts. per pound, the estimated average receipts per head of sheep kept (yearlings included) prior to 1916 were \$478.77 (\$33.46 per animal unit (7 sheep)). During the same period the receipts per animal unit of dairy stock (1 cow or 2 head of young cattle), including the estimated value of skim milk, were \$75.52. The feed and labor costs during the period are estimated at \$38.50 per animal unit of sheep and \$67.34 per animal unit of dairy stock. On this basis the sheep lacked \$5.04 per animal unit of paying for feed and labor, and the dairy stock left a margin of \$8.17 over these costs. Assuming the same relative returns from sheep and dairy cattle, it is estimated that for 1917 prices the net profit over feed and labor cost per animal unit of sheep was \$33.18, as compared with \$12.72 from dairy stock.

The possibility for the improvement and expansion of the sheep industry in New England is pointed out.

The sheep-killing dog, J. F. WILSON (*U. S. Dept. Agr., Farmers' Bul. 633 (1918), pp. 32, figs. 2*).—This publication, which supersedes Farmers' Bulletin 632 (*E. S. R., 32, p. 866*), presents a general discussion of the subject, points out the great annual loss due to the stray dog, and describes a fence trial run by the Forest Service and found to be proof against dogs and coyotes.

A digest of existing State dog laws, given for the guidance of those interested in promoting legislation against sheep-killing dogs; and the complete dog laws of Pennsylvania and West Virginia, given as being examples of modern laws which really offer protection to flockmasters, are appended.

Alkali and weathering studies with wool, J. I. HARDY ET AL. (*Wool Inst. Sta. Rpt. 1917, pp. 164-169*).—Investigations upon the effect of alkali salts on the strength of wool fiber under range conditions and under more severe conditions planned in the laboratory are summarized.

The results of analyses of 16 samples of wool from range ewe fleeces are tabulated, showing on an air-dry basis the percentages of moisture, ether extract, water extract, pure wool fiber, and sand, dirt, etc., in the wool. The water extract of these samples of wool was ashed, and its sodium, potassium, calcium, and magnesium contents were determined. The results are tabulated, together with the average breaking strength of from 100 to over 1,000 fibers of each sample.

The effects of alkali and weathering upon the breaking strength of the samples under range conditions do not seem to be notable. The breaking strengths of these samples were then determined after treatment for one week with (1) 10 per cent sodium carbonate, (2) 10 per cent sodium sulphate, and (3) 10 per cent magnesium sulphate. It was noted that the breaking strength of the samples was but slightly affected by these treatments with alkaline solutions.

Using the same 16 wools, sets of samples of crude wool (wool in grease) and clean wool were next treated for one year as follows: (1) Allowed to weather naturally, (2) alkali treatment, (3) treated with 10 per cent sodium carbonate and weathered, (4) treated with 10 per cent sodium sulphate and weathered, and (5) treated with 10 per cent magnesium sulphate and weathered. Treatments 2, 3, 4, and 5 were repeated every week or ten days throughout the year. The breaking strengths were then determined. It was found that the untreated crude wool had a greater breaking strength than the clean wool or any of the treated samples. The clean wool, while somewhat weakened in the cleaning, was also stronger than any of the treated samples. Samples treated with sodium carbonate while weathering had the smallest average breaking strength of any of the samples. The sodium sulphate and magnesium sulphate treatments had practically the same effect on the average breaking strengths.

The use of hogs in disposing of crops. F. KNORR (*U. S. Dept. Agr., Bur. Plant Indust., Work Scottsbluff Expt. Farm, 1916, pp. 11, 12*).—Results are given of grazing plots of alfalfa and corn with hogs in 1916, together with a summary of the four years 1913 to 1916 (*E. S. R., 36, p. 170*). The hogs were put on the alfalfa from early spring until fall, with a supplementary ration of corn at the rate of 2 lbs. for each 100 lbs. of live weight. Two lots of hogs were used in the grazing test. The first lot of pigs was farrowed the previous season and taken off pasture June 28. The second lot was farrowed in the spring and began grazing June 29. At 7 cts. a pound for pork and 60 cts. a bushel for corn the net return from the first lot was \$64.64, and from the second lot \$82.32, or \$146.96 for the season of 1916. With alfalfa pasture at \$7 a acre for the first lot and \$8 for the second lot and corn at 60 cts. per bushel, the feed cost of producing a pound of gain was 3 cts. for lot 1 and 2.8 cts. for lot 2. The average feed cost per pound of gain for the four years was 3.04 cts. With an average yield of 5.78 tons of alfalfa hay per acre the hogs paid the feed cost of \$25.41 a ton for the 1916 crop.

The hogs made 840 lbs. of gain per acre of corn, the estimated yield being 925 bushels per acre. The average return per acre of corn for the five years 1912 to 1916 was 748 lbs. of pork.

Grazing crops for hogs, L. W. OSBORN (*Arkansas Sta. Circ. 36, pp. 4*).—A note for a succession of crops for hog pasture is outlined, and notes are given on the culture and value of various crops for grazing swine.

Forage for swine, J. J. YOKE (*West Virginia Sta. Circ. 28 (1918), pp. 4*).—Notes are given on lowering the cost of producing pork by the use of forage crops, together with suggestions for the proper use of grain supplements for feeding and plans for seeding and grazing forage plots.

The self-feeder in pork production, W. J. CARMICHAEL. (*Illinois Sta. Exp. 218 (1918), pp. 8, figs. 3*).—Notes are given on the types of self-feeders that have been found satisfactory in tests at the station, and hints and precautions are outlined for their successful use in swine production.

In feeding experiments at the station in which pigs averaging 47 lbs. were fed shelled corn and tankage in self-feeders, the daily feed consumption per head ranged from 2.1 lbs. of corn and 0.4 lb. of tankage during the first period of four weeks to 3.8 lbs. of corn and 0.54 lb. of tankage during the third four-week period and 7.3 lbs. of corn and 0.26 lb. of tankage during the final 12 days following the fifth four-week period. At the end of the test the pigs averaged 259 lbs. in weight each, and they gained an average during the test of 1.3 lbs. per head daily. A second lot fed middlings in addition to corn and tankage consumed practically the same amount of corn and tankage as those of the first lot, and in addition more than twice as much middlings as tankage. This lot gained at the rate of 1.4 lbs. per head daily and had a final weight of 277 lbs. each.

Sorghum grains v. corn for fattening swine, H. E. DVORACHEK and H. A. SANBHOUSE (*Arkansas Sta. Circ. 34, pp. 4*).—The object of the experiment reported was to determine the relative feeding value of the grains of Kafr corn and feterita for fattening pigs. Fifteen shotes averaging about 116 lbs. each, in three lots of five each, were fed as follows: Lot 1, Kafr corn and tankage (9:1); lot 2, feterita and tankage (9:1); and lot 3, corn and tankage (9:1). The grains were ground and mixed with the tankage.

The average daily gains per pig were 1.46 lbs. for lot 1, 1.47 lbs. for lot 2, and 1.2 lbs. for lot 3. To produce 1 lb. of gain it required 3.33 lbs. of Kafr corn and 0.37 lb. of tankage for lot 1, 3.3 lbs. of feterita and 0.37 lb. of tankage for lot 2, and 4.02 lbs. of corn and 0.45 lb. of tankage for lot 3. The results of this experiment indicate that when Kafr corn and feterita can be purchased at the same price as corn or cheaper they may be substituted economically for corn for fattening swine.

The influence of peanuts and rice bran on the quality of pork, L. D. DICK (*Texas Bul. 224 (1918), pp. 5-14, fig. 1*).—The purposes of this experiment were to determine (1) the value of peanuts as hog feed; (2) the kind of pork that peanuts will produce; (3) whether soft or oily pork can be profitably handled by feeding a grain ration; (4) whether or not hogs can be prevented from getting soft grazing on peanuts by feeding a half grain ration; (5) the kind of pork produced by milo maize and rice bran; and (6) the feeding value of the different rations. The experiment involved 12 lots of 10 pigs each, averaging 107 lbs. per head. The different lots were started at varying intervals beginning October 12, 1916, and all the lots came off the experiment January 19, 1917. For 20 days or more previous to the experimental periods all the hogs were fed a balanced grain ration of milo maize chop and meat meal. All the lots except 1, 2, 11, and 12 grazed on peanuts or were fed peanuts in dry lots.

The hogs grazing on peanuts produced an average of 158 lbs. of pork per acre, the estimated yield of peanuts being 19 bushels. The peanut-fed hogs that were finished on grain were changed gradually from peanuts in order to prevent the animals from going off feed. The success of this method is indicated by the fact that every lot made its best gains during the week of the change. The lots on cottonseed meal and milo maize were fed for 80 days without any signs of cottonseed meal poisoning.

Some of the results of the feeding and slaughtering tests are given below:

Effect of peanuts and rice bran on pork.

Ration.		Daily gains per head.		Feed per pound of gain.	Shrinkage in shipping.	Condition of carcass after 24 hours in cooler.	
Kind of crop.	Period.	Kind of grain.	Period.	On peanuts.	On dry lot.	Firm.	Oily.
<i>Days.</i>		<i>Days.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>	<i>P. ct.</i>	<i>No. of hogs.</i>
1		Milo chop.	80	1.07	5.11	3.0	10
2		Cottonseed meal, milo chop (1:3).	80	1.46	4.26	2.4	10
3	80	Milo chop (half ration).	80	1.375	1.44	3.18	1
4	80	Cottonseed meal, milo chop (1:3).	80	1.530	1.54	4.9	5
5	80	Cottonseed meal, milo chop (1:3, half ration).	80	1.550	2.07	1.93	5
6	40	Cottonseed meal, milo chop (1:3).	30	1.450	1.91	5.65	10
7	30	.....	45	1.310	1.76	4.63	10
8	60	.....	60	1.718	1.64	4.24	10
9	40	Milo chop.	45	1.315	1.61	5.03	10
10	40	Meat meal, milo chop (1:10).	45	1.327	1.74	4.96	10
11		Cottonseed meal, rice bran (1:10).	80	.....	5.83	9.0	15
12		Cottonseed meal, rice bran, milo chop (1:4:4).	80	.....	1.34	4.65	10

¹ One pig removed, sick.

At the beginning of the test two hogs from a check lot were slaughtered and cooled in a cooler and held at a temperature of 32° F. After 24 hours they were firm. At the end of 40 days four hogs that had grazed with lot 8 on peanuts were slaughtered and held at freezing temperature. These carcasses were soft and oily both at 24 and 48 hours of cooling. At the end of the experiment the hogs were sold to a packing house in Fort Worth, Tex., subject to a killing test. They were followed through the packing plant to the cooler and examined and checked by the author and an expert cooler man after being held in the coolers for 24 hours at from 32 to 35°. The results of this examination are given in the above table.

In addition to the slaughter test, melting point determinations were made by the station chemist of samples of fat taken from the leaf fat, shoulder, and back of three hogs of each lot. The results of these determinations are charted. It is noted that the back and shoulder fats had a much lower melting point than the leaf fat. The hogs fed peanuts throughout the period, and killing soft, showed a much lower melting point than those receiving a straight grain ration throughout, and also showed a lower melting point than those fed grain for 30 to 60 days after grazing on peanuts 40 days. In practically every case the melting point test corroborated the test in the coolers. The hogs were valued at the beginning of the test at 7.5 cts. per pound. They sold for 10.9 cts. on the Fort Worth market, the soft or oily hogs being docked 15 cts. per pound. In spite of high prices for feed and labor a profit was made on every lot but lot 1.

[Cost of wintering brood sows], M. F. GRIMES (*Delaware Sta. Rpt. 1917, pp. 17, 18*).—Five lots of Berkshire sows were fed from November 21, 1916, to January 30, 1917. The sows were bred shortly before the experiment began. The rations consisted of alfalfa hay and corn on the ear for lot 1, cut alfalfa

hay and hominy meal for lot 2, corn silage, corn, and middlings for lot 3, and corn and middlings for lot 4. The weights of all the sows were practically the same at the end as at the beginning of the test. It is noted that the consumption of 549 lbs. of cut alfalfa by lot 2 and 550 lbs. of silage by lot 3, represent the amount of grain needed for maintenance by nearly 25 per cent as compared with lots 1 and 4 where the sows ate little else than grain.

[Inbreeding experiments with pigs], H. HAYWARD (*Delaware Sta. Rep. 1917, p. 17*).—A brief progress report is made of inbreeding experiments being carried on with pigs at the station. By double mating the inbred Berkshire sows with an inbred Berkshire boar and a pure-bred Chester White boar, a number of litters have been obtained containing pigs by each sire. In these cases the white pigs have been a check upon their black inbred litter mates. "In growing out these litters the greatest difference has been noted in the superior size, growth, and vigor of the crossbreds compared with the purebred pigs."

The agricultural situation for 1918.—**XI. Poultry.**—One hundred hens on every farm—one hundred eggs from every hen (*U. S. Dept. Agr., Office Ser. Circ. 107 (1918), pp. 24*).—The plan is made for a large increase in the production and utilization of poultry and eggs in the present crisis, especially for increased production on the general farm where poultry subsists largely on waste grain and other waste products. A standard of 100 hens on every farm in the United States is urged, and hints are given on the breeding and management of hens for the minimum egg production of 100 eggs per hen annually. Notes on the care and management of ducks, geese, turkeys, guineas, and pigeons are included, and suggestions are outlined for the keeping of hens in back yards in cities and towns.

New Jersey's poultry program for 1918, H. R. LEWIS (*New Jersey Sta. Hints to Poultrymen, 6 (1918), No. 7, pp. 4*).—An outline of plans being followed for the stimulation of poultry production in New Jersey.

Egg-producing values of some Texas feeding stuffs, R. N. HARVEY (*Texas Sta. Bul. 220 (1917), pp. 5-11, figs. 2*).—The object of the experiment here reported was to determine whether or not rations composed entirely of vegetable feed can be fed as profitably as rations consisting in part of meat feeds, and also to determine the relative feeding values of skim milk, cottonseed meal, meat scrap, and peanut meal for laying hens. The test lasted 24 weeks from December 20, 1916. The hens used were standard-bred White Leghorns of a good strain and were fed in yards. The rations consisted of milo, maize, beans, and shorts, and a protein supplement. This supplement was skim milk for lot 1, cottonseed meal for lot 2, meat scrap for lot 3, and peanut meal for lot 4. The amounts being calculated to furnish equal quantities of protein, with the meat scrap ration as a basis.

The average egg production per hen during the 24 weeks was 89.95 for lot 1, 59.95 for lot 2, 75.31 for lot 3, and 56.8 for lot 4. The cost of producing a dozen eggs for the respective lots was 16.6, 19.9, 17.2, and 20.5 cts. The number of pounds of feed required to produce a dozen eggs was 9.41 for the skim milk pen, 5.75 for the cottonseed meal pen, 4.86 for the meat scrap pen, and 5.8 lbs. for the peanut meal pen.

It is noted that the pens which cost the most in feed per hen gave the greatest returns per hen. The hens receiving some animal feed were more profitable than those receiving vegetable feed only. Vegetable feeds with high protein content seemed unable to replace animal feeds in the ration. The fowls preferred the ration containing animal feed and ate it in larger quantities. Skim milk appears to be more profitable than meat scrap as a source of protein, when it can be obtained at a reasonable cost.

On the differential effect of certain calcium salts upon the rate of growth of the two sexes of the domestic fowl, R. PEARL (*Science, n. ser.*, 33 (1916), 3: 114), pp. 687, 688; *abs. in Maine Sta. Bul.* 268 (1917), p. 305).—Daily doses of from 0.1 gm. to 0.3 gm. of calcium lactate and calcium lacto-phosphate, respectively, were fed to chicks, beginning when the chicks were 25 days of age and continuing until they were 107 days old. Neither of these calcium salts affected the rate and amount of growth in the male chicks, but at the end of the 142-day period the females were so much larger than the control females that there had been eliminated 58.4 per cent of the normal difference in body weight between the sexes. The reproductive organs of the females were also stimulated, the rate of egg production in the lacto-phosphate females being nearly five times as great as in the controls.

A very small amount of corpus luteum substance administered daily along with the calcium lacto-phosphate completely inhibited the stimulating effect of the latter.

Sex studies.—VIII. The sex ratio in the domestic fowl, R. PEARL (*Proc. Amer. Phil. Soc.*, 56 (1917), No. 5, pp. 446-446, figs. 3; *abs. in Maine Sta. Bul.* 268 (1917), p. 309).—In this paper statistical data are presented and analyzed regarding the normal sex ratio in the domestic fowl. The statistics cover eight years and represent over 22,000 chicks.

Of 20,637 chicks examined in families or single matings of 10 or more offspring, 48.57 per cent were males. The excess of females was fairly regular during the eight years covered by the study. The ratio in individual families is shown to be approximately symmetrical about the mean, with high contact at both ends. These fitted curves indicate that in every 1,000 families of 20 birds 1 is expected containing 20 pullets.

During 1916 and 1917, 927 of the 1,921 dead embryos examined were males and 994 females. The conclusion is reached that prenatal mortality is not differential in respect to sex, and that in consequence the observed sex ratio at birth is subsequently the same as the initial zygotic sex ratio.

Sex studies.—IX. Interstitial cells in the reproductive organs of the chicken, ALICE M. BOWING and R. PEARL (*Anat. Rec.*, 13 (1917), No. 5, pp. 253-268, figs. 6; *abs. in Maine Sta. Bul.* 268 (1917), p. 308).—Further facts are presented, together with a review of literature, regarding the nature and distribution of interstitial cells (*E. S. R.*, 27, p. 869; 34, n. 264).

True, secreting interstitial cells were found in abundance in all mature ovaries examined. No such cells were differentiated in the newly hatched female chicks or guineas examined. These cells are cytologically identical in the fowl and in the cow. Examination of testicular material from 64 male fowls ranging in age from newly hatched to 18 months showed the presence of interstitial cells in the testes of the 4 newly hatched birds, but not in any of the 60 mature birds. The authors conclude that the facts regarding the occurrence and distribution of interstitial cells are such as to make it very difficult to suppose that they have any causal effect upon secondary sex characters.

The experimental modification of germ cells, R. PEARL (*Jour. Expt. Zool.*, 23 (1917), Nos. 1, pp. 125-186, figs. 7; 2, pp. 241-310, figs. 7; *abs. in Maine Sta. Bul.* 268 (1917), pp. 297-303).—The following papers are reported in a series of studies of attempts to modify hereditary factors or determinants and to note the hereditary behavior following such modifications.

1. General plan of experiments with ethyl alcohol and certain related substances (pp. 125-164).—In this series of investigations the problems specifically dealt with were the precise and specific changes in the germinal material, if any, caused by the continued administration of ethyl alcohol or similar narcotic poisons to the domestic fowl. A study was also made of the effects upon the soma of the treated in-

dividual of the continued administration of such poisons to give a clue as to the probable origin or mechanism of germinal changes. The fowls used in the experiments were Black Hamburg males and Barred Plymouth Rock females, and their F_1 offspring. Each treated bird had from one to five or six untreated full sisters to serve as controls. Both strains had been used by the author in a variety of Mendelian experiments, and their genetic behavior was well known. Complete data are given as to the breeding of the foundation animals used in this study, covering a period of four years before the beginning of the experiments. The amount and intensity of inbreeding in the parents of the experimental birds was low.

Attempts were made to modify the germ cells by treating the fowls with ethyl alcohol, methyl alcohol, or ether. The poisons were administered by inhalation. To determine the time during which the parents were subjected to treatment with the alcohol prior to the birth of the offspring, a measure designated as the "total germ dosage index" is proposed. This is defined as the total number of days during which the two gametes making the offspring zygote were exposed to alcoholic influence while sojourning in the bodies of the treated individuals. The treatment of the F_1 generation ranged from 130 to 354 days, with a mean of 210.35 days.

A bibliography of 43 titles is listed.

II. *The effect upon the domestic fowl of the daily inhalation of ethyl alcohol and certain related substances* (pp. 165-186).—In describing the effects of alcohol and related substances on the germs of fowls, attention is first given to the physiological and structural effects on the treated fowls. During the first 15 months of the experiments the only ones of the treated birds which had died were seven which were killed by an overdose of the reagents, while the mortality of the control birds was 41 per cent. This high mortality of the control birds was largely due to an epidemic of diphtheritic roup, and although the poisoned birds were exposed in every way just as were the controls none of them contracted the disease. No male birds died. Immediately following the beginning of treatment in the autumn there was an increase in body weight of treated birds, which is thought to be not due to the treatment. From January and February to May and June there was a sharp and prolonged fall in body weight which was followed by a steady increase. On February 1, 1916, the treated birds averaged 9.9 per cent heavier than the controls. The egg production of the treated birds and the controls was normal, both in seasonal distribution and in amount. The mean production per bird during the 15 months was for the untreated flock 184.74 eggs and for the treated hens 183.97 eggs.

III. *The effect of parental alcoholism and certain other drug intoxication upon the progeny* (pp. 241-310).—In this paper are discussed the observable effects of the alcoholization of one or both of the parents upon the F_1 progeny. It was found that the fertility of the eggs where one or both individuals were treated was reduced in direct proportion to the dosage of poison. Both prenatal (dead embryos) and postnatal mortality was materially smaller where one or both parents were treated than in the controls. There was no relation between the calculated reproductive capacity of the alcoholized birds and the total dosage to which their gametes were subjected during the breeding season of 1915. The sex ratio of the progeny was not significantly affected by the treatment of parents. There was no material difference in mean hatching weight between the offspring of treated males and those of control males when both were mated to normal untreated females. Both the male and the female offspring of matings in which both parents were treated were materially heavier when hatched than the offspring of either the completely normal control mat-

ages or of matings in which the father only was treated. The adult offspring of alcoholized parents (one or both) were heavier than the controls. No difference in rate of growth was noted in the offspring until the males were 100 days old and the females 150 days old. The normal Mendelian inheritance in the F_2 in so far as the phenomena of dominance, recessiveness, and sex linkage were concerned, was not affected by the treatment of parents.

These experiments apparently furnish no evidence that specific germinal changes have been induced by the alcoholic treatment, at least in those germ cells which produced zygotes; nor is any evidence found that the germ cells which formed zygotes were in any way injured or adversely affected. These results are accounted for on the hypothesis that alcohol and similar substances act as selective agents upon the germ cells of treated animals. The essential points in this hypothesis are explained.

The probable error of a difference and the selection problem, R. PEARL (*Genetics*, 2 (1917), No. 1, pp. 78-81; *abs. in Maine Sta. Bul.* 268 (1917), p. 503).—This paper questions the arithmetical calculation of the probable error of a difference used by J. E. Aekert¹ in interpreting selection experiments with *Paramecium*. Aekert's results as corrected by the author are briefly discussed.

A note on the fitting of parabolas, J. R. MINER (*Proc. Nat. Acad. Sci.*, 3 (1917), No. 2, pp. 91-95; *abs. in Maine Sta. Bul.* 268 (1917), p. 504).—This paper gives formulas and tables for the fitting of parabolas by the method of moments, taking origin one unit below the first ordinate.

DAIRY FARMING—DAIRYING.

The four essential factors in the production of milk of low bacterial content, S. H. AYERS, L. B. COOK, and P. W. CLEMMER (*U. S. Dept. Agr. Bul.* 642 (1918), pp. 61, pls. 6, figs. 23).—These experiments on the production of milk practically free from visible dirt and of low bacterial count were performed in a small experimental barn at the Dairy Division farm at Beltsville, Md. The building provided space for four cows and was of wooden construction throughout, including floor, gutters, and mangers. The term "production of milk," as used in the bulletin, covers only the period from the time the milk leaves the cow until it is in the delivery cans or bottles.

Beginning with conditions in which the barns and cows were as filthy as possible, certain factors causing contamination of milk were eliminated gradually until milk of the desired quality was produced. The conditions were then duplicated in order to determine again the value of the essential factors. In the first experiments, which lasted from July 22 to August 14, 1915, the manure was removed from the barn once a week, and as a result varying quantities of filth were present on the floor and on the cows. Two of the cows were milked into open and the other two into small-top pails which were washed clean and unsterilized. The milk was then poured into clean, unsterilized cans in the barn, after which it was carried to the milk house, where samples were taken immediately both night and morning and examined before cooling. The average bacterial count of 32 samples from the open pails was 107,653 per cubic centimeter, and from the small-top pails 368,214. The relatively low bacterial count of milk produced under such filthy conditions is deemed interesting and indicates that large numbers of bacteria are not commonly found in fresh milk.

The next test, which lasted from September 14 to October 7, 1915, was a duplicate of the first, except that sterilized cans and bottles were used. The average count of 36 samples of milk from the open pails was 22,677 bacteria per cubic centimeter, and from the small-top pails 17,027. In 29 of the 36 samples

¹ *Genetics*, 1 (1916), pp. 387-495.

the bacterial count from the open pails was higher than that from the small-top pails.

In the third test the cows and floor were dirty, the manure was removed only once a week, the udders and teats of the cows were washed, and sterilized utensils were used. During the period of this test, November 10 to 24, 1915, the average bacterial count of 18 samples from open milk pails was 6,165 and of 23 samples from small-top pails, 2,886. Of 12 samples of milk drawn directly from the udder into sterile tubes at about the middle of the milking period, the average count was 987 bacteria per cubic centimeter.

In the fourth experiment the cows were cleaned daily with currycomb and brush and bedded, the floors were kept clean, the manure was removed daily, the udders and teats of two cows were washed and of two others not washed, and the utensils were sterilized. Small-top pails were used throughout the experiment, which lasted from February 28 to April 10, 1916. Of 65 samples the average count from washed udders and teats was 2,154 bacteria per cubic centimeter and from unwashed udders and teats 4,524. Bacteriological examinations by the milk tube method of samples of the fresh milk produced under the conditions of this test and of samples of the middle milk as drawn from the udder indicate that milk of a high quality from a bacteriological standpoint was being produced.

In duplicating the conditions in the above experiments, the fifth experiment was performed under conditions similar to those in experiment 2. Of 41 samples of milk examined from both small-top and open pails, from April 13 to May 6, 1916, the average bacterial count from the small-top pails was 24,439 and from the open pails 86,212 per cubic centimeter.

Experiment No. 6, lasting from May 8 to 31, 1916, was conducted under conditions similar to those in No. 1. The average bacterial count of 36 samples of milk from the small-top pails was 114,497, and from the open pails, 153,507 per cubic centimeter.

Experiment No. 7 was conducted under the same conditions as No. 4, except that the cows were not bedded. The floor of the stable was kept comparatively clean, the manure was removed daily, the utensils were sterilized, and at the milking the cows were cleaned and the udders and teats were wiped with a damp cloth. Of the 15 sets of samples examined in this test from June 5 to 15, 1916, the average number of bacteria per cubic centimeter was 4,917 from open pails, and 2,667 from small-top pails.

In order to obtain additional information on the effect of the use of sterilized utensils an examination was made of 60 samples of milk from 40 sterilized and unsterilized small-top pails. Each set represented two samples taken at the same milking, when two cows were milked into a sterilized pail and two into an unsterilized pail. The average count from the sterilized pail was 6,306 per cubic centimeter, as compared with 73,308 from the unsterilized pail. Another series of samples of milk drawn from dirty utensils when the manure was removed only twice a week showed an average bacterial content of 31,040 per cubic centimeter from sterilized utensils and 694,520 per cubic centimeter from unsterilized utensils. In this comparison an examination was made of milk under the same barn conditions, but with manure treated in a different manner. After milking, the milk was poured from the utensils, but the drainings were allowed to remain. The utensils were then placed upright on the floor until the next milking, when they were washed in the same manner as in previous experiments. The average bacterial count of 84 samples taken under these conditions was 1,667,600 bacteria per cubic centimeter.

Results are given of determinations of bacteria obtained in different rinsings of cans and bottles and in sterilized cans which were covered before being

These show the possibility of great contamination from unsterilized pails and from sterilized utensils not properly dried. Sediment tests made on strained milk show in almost every instance less sediment from the use of small-top pails than from open pails. When fresh, unstrained milk, handled by sterilized utensils was examined a fairly constant relation was found to exist between the quantity of sediment and the bacterial content. This relation was found to be influenced by the variable number of bacteria in manure. A number of bacteria per gram in 57 samples of fresh cow manure varied from 2,000,000 to 600,000,000, with an average of 49,645,614. On the basis of this average, 0.5 gm. of fresh manure per pint of milk would add to the milk about 53,000 bacteria per cubic centimeter, while 0.01 gm. of manure per pint would add 1,057 bacteria per cubic centimeter. These figures confirm previous conclusions that manure is not as great a factor as unsterilized utensils in the contamination of milk by bacteria.

The results of these experiments indicate that the three essential factors of influence in the production of milk of low bacterial content are, in the first named, the use of sterilized utensils, clean cows, and small-top milk pails. The practical value of these three essential factors was tested on six farms in the vicinity of Grove City, Pa. These six farms scored according to the May farm score card of the Dairy Division 44.1, 42, 40.5, 41.1, 40.9, and 38.1, respectively, out of a possible 100. The average bacterial count of 93 samples of milk taken from the five farms under ordinary conditions was 87,391 per cubic centimeter, which was reduced to 4,602 after the introduction of the three essential factors.

In order to obtain further information on the bacterial content of fresh milk as produced under ordinary farm conditions, 249 samples of fresh, strained, cooled milk from 12 farms around Grove City, Pa., were examined during the summer of 1916. The night samples averaged 115,135, and the morning samples, 180,036 bacteria per cubic centimeter, the general average being 125,146. A study was next made of the effect of holding milk at different temperatures for varying lengths of time. Samples of milk were held at 40, 50, and 60 F., and examined when fresh and after intervals of 24 hours for 96 hours. The milk was produced in the experimental barn under three different sets of conditions, as follows: (1) Cows were clean and bedded; the udders washed out of the time and left unwashed part of the time; the small-top pail used; and all utensils were sterilized. (2) Cows were dirty; the manure was removed twice a week; both open and small-top pails used; and all utensils were sterilized. (3) Conditions same as second, except that the utensils were not sterilized.

The following table shows the average number of bacteria per cubic centimeter in a large number of samples of milk produced and held under the conditions mentioned:

Bacteria per cubic centimeter in milk held at different temperatures.

Conditions.	Temperature.	Age of milk.				
		Fresh.	24 hours.	48 hours.	72 hours.	96 hours.
Small-top utensils sterilized.....	40	4,295	4,138	4,566	5,427	19,631
Open-top utensils sterilized.....	40	39,082	88,028	121,864	156,245	1,036,952
Small-top utensils not sterilized..	40	136,533	261,646	528,755	749,020	852,835
Open-top utensils sterilized.....	50	4,295	15,961	157,527	5,735,257	39,499,625
Small-top utensils sterilized.....	50	39,082	17,437	831,615	1,702,454	12,025,196
Open-top utensils not sterilized..	50	136,533	1,170,546	13,662,115	25,687,541	47,597,272
Small-top utensils sterilized.....	60	4,295	1,587,333	33,911,111	326,569,999	262,785,714
Open-top utensils sterilized.....	60	39,082	4,461,111	99,120,000	633,375,000	1,365,679,999
Small-top utensils not sterilized..	60	136,533	28,653,571	639,884,615	2,497,983,333	5,346,666,666

The market milk business of Detroit, Mich., in 1915, C. E. CLEMENT and G. P. WARBLE (*U. S. Dept. Agr. Bul. 639 (1918), pp. 28, pls. 3, figs. 13*).—A study is reported of the market milk business as conducted in Detroit, Mich., during the year 1915, with the view of explaining some of the market conditions and milk marketing practices in the larger American cities.

The pasteurization of market milk had been made compulsory by ordinance in Detroit three months before the investigations were begun, so that a special study was also made of the effects of compulsory pasteurization upon the number of dealers engaged in the business and upon the methods of handling and distributing milk.

The cost of delivering milk for 28 dealers, including items of administrative office expenses, taxes, and other miscellaneous expenses was on the average 2.45 cts. per quart.

Among the conclusions it is noted that "a lack of standardization in the construction and equipment of country milk stations contributed largely to the varying costs of handling milk in the country. . . . The variation in costs of preparing milk for city distribution was caused primarily by a lack of standardization in plant construction and equipment, and by the fact that some plants were not run efficiently or at full capacity. The low cost of delivering milk in wholesale quantities to retail stores suggests possible economies by dealers if such a system of distribution were practiced by all. The cost of handling milk distributing in the city does not vary directly in proportion to the number of gallons handled, although the larger dealers do effect certain economies not possible to the smaller ones."

Feeding the dairy calf, A. B. NYSTROM (*Washington Sta., West. Wash. Mo. Bul. 6 (1918), No. 1, pp. 5-8*).—Brief directions are given for raising dairy calves, especially under conditions where whole and skim milk are largely unavailable.

Sunflower silage for dairy cows.—A preliminary report, C. N. ARNETT and O. TUNSTVEN (*Montana Sta. Bul. 118 (1917), pp. 73-80*).—Two lots of 7 cows each were fed for two 28-day periods by the reversal method a ration of grain (oats, malt sprouts, and bran 5:2:3) and choice alsike clover hay. In addition, one of the lots was fed Giant Russian sunflower silage. During the 28 days the 14 cows on grain and hay gained an average of 11 lbs. in weight and produced an average of 33.57 lbs. of milk and 1.382 lbs. of fat per head daily. During the 28 days on grain, hay, and sunflower silage the cows gained an average of 6 lbs. and produced an average of 34.35 lbs. of milk and 1.41 lbs. of fat per head daily. They ate an average of 34 lbs. of sunflower silage per head daily, which effected a saving of 9 lbs. of clover hay. No objectionable flavors or change in the milk due to the silage could be detected.

Breeding milking Shorthorns, E. W. SHEETS (*West Virginia Sta. Bul. 1915 16, pp. 28, 29*).—A short progress report is made of an experiment in the cost of milk production with milking strains of the Shorthorn breed, and the cost of producing beef with their offspring. The average feed cost of products for seven cows during one to four lactation periods was 32.5 cts. per pound for milk fat and \$1.33 per hundredweight for milk. In obtaining these data all grains were charged at \$30, alfalfa hay at \$20, and corn silage at \$10 per ton and pasture at \$2 per month.

Testing milk and cream for butter fat, R. E. CALDWELL, T. H. BROUGH, and S. L. ANDERSON (*Indiana Sta. Circ. 78 (1918), pp. 15, figs. 221*).—Directions are given for the use of the Babcock test in testing milk, cream, skim milk, buttermilk, and whey for milk fat.

Marketing butter and cheese by parcel post, L. B. FLOHR and R. C. FORD (*U. S. Dept. Agr., Farmers' Bul. 930 (1918), pp. 12, figs. 6*).—Experimental

Shipments of more than 2,000 lbs. of butter in 2, 3, 5, and 10 lb. parcels were made from four creameries to the Bureau of Markets of this Department to test possibilities of parcel-post shipping of butter. Of 222 shipments from April to October from a creamery 375 miles from Washington, 218 were received in satisfactory condition. During July and August only one package out of 61 shipments was received in an unsatisfactory condition from a creamery 536 miles from Washington. In June and July 73 out of 82 shipments from a creamery 187 miles from Washington arrived in good condition. The fourth creamery, located 206 miles from Washington, shipped 89 packages from April to January, and all arrived in satisfactory condition. These satisfactory results are attributed to the care exercised in the proper packing of the butter in suitable shipping containers and the thorough precooling of the butter at the creameries before shipment.

Shipments of the butter received from the creameries were made to experiment stations, and return shipments were made of the same. These were satisfactory when the temperature was not too high or the distance too great. The results of these experimental shipments indicate that well-made butter, properly chilled before shipping, when packed in a suitable container, may be shipped satisfactorily by parcel post when extreme high temperatures are not encountered. Even though proper safeguards were taken, the shipments made during extremely hot weather frequently arrived in an oily and unsatisfactory condition.

Brief directions are given for the marketing of butter and cheese by parcel post.

Conserving sugar in ice cream manufacture. H. A. RUEHE (*Illinois Sta. Rep.* 219 (1918), *folio*).—Methods for the conservation of sugar in ice cream manufacture by the use of invert sugar sirup, corn sirup, or glucose are discussed. Directions are given for making invert sugar sirup.

VETERINARY MEDICINE.

Department of veterinary science and bacteriology (*Nevada Sta. Rpt.* 1917, p. 44-56).—A potent antianthrax serum has been prepared. It is pointed out that the serum-vaccine method has the advantage over the double vaccination method of Pasteur of conferring immediate immunity with but one handling of the cattle.

The results of chicken cholera studies have been previously noted (*E. S. R.* 37, p. 183). The work on equine anemias has been suspended for lack of material. The serum treatment of hemorrhagic septicemia has been noted from other sources (*E. S. R.*, 38, p. 781). The theory is advanced that drainage of wet pastures may ultimately solve the problem of the control of the disease. Until this can be accomplished seasonable vaccination and the prompt treatment of cases with antihemorrhagic septicemia serum will reduce losses to a minimum.

Experiments on hog-cholera serum purification by chemical precipitation have shown that both the euglobulin and pseudoglobulin fractions are potent so that the entire globulin content must be used. Eight lots of serum have been processed and tested upon pigs by the simultaneous use of the globulins and hog-cholera virus, the results showing that the globulins apparently protect hogs against inoculation as successfully as does raw serum. Considerable difficulty, however, has been encountered in the filtration of the globulin solutions. Preliminary experimental work has shown that a similar method can be used to filter and concentrate antianthrax serum. It is probable, however, that of the

various antisera to which this method of separation of the active principle may prove applicable each may require a somewhat different treatment.

Further study of contagious epithelioma in chickens (E. S. R., 35, 1917) has given additional evidence that it is a group of infections rather than a single infectious disease. Studies on "scab virus" are being continued to determine its filterability, thermal death point, effect of prolonged immersion in glycerin, specific serum reaction, and the possibility of growth inside the bodies of chickens.

Plant poisons (Nevada Sta. Rpt. 1917, pp. 58-61).—Work with death camas (*Zygadenus intermedium*) shows it to be poisonous at all stages of its growth. The leaves are poisonous prior to blooming and at the blooming period all parts of the death camas are poisonous, the flower cluster being the most poisonous per unit weight of material, the tubers next, and then the leaves, while the stems are the least poisonous. After the plant has reached the seedling stage the seeds are the most poisonous. The tubers appear to be poisonous at all times but due to being from 4 to 6 in. below the surface of the ground they play no direct part in the poisoning of range animals.

Physiological tests made of extracts from the blue lupine (*Lupinus sp.*) and flowers prior to seedling stage have shown them to be nontoxic to man. In work with a species of goldenrod (*Solidago spectabilis*), which had been found to cause the death of a number of sheep the season before, it was found that the poisonous principle in the leaves is either potash or iron, or both.

A new poisonous plant, the poison alkali brush (*Tetradymia glabrata*), was discovered during the year after having caused the poisoning of 1,100 sheep belonging to a single sheepman. Analyses of the tips of the brush showed the presence of 25.9 per cent soluble potash in the ash, equivalent to 2 per cent chlorid of potassium in the green twigs.

Report of research chemist, O. A. BEATH (Wyoming Sta. Rpt. 1917, pp. 156-159).—A brief report of work with poisonous plants.

Lupinus arbusculus, regarded as the most poisonous of the native lupines, was submitted to an alkaloidal assay with the following results: Early pods, 0.000 per cent; late seeds, 0.3346 per cent; early leaves, 0.3196 per cent; late pods, 0.2087 per cent; flowers, 0.232 per cent; early seeds, 0.1178 per cent. The alkaloids were computed as lupinin.

The finely powdered plants were exhausted with alcohol and the crude poisons after one purification were given to rabbits intravenously. In order of the following results were obtained: Early pods, lethal dose, 17 mg. per 500 gram weight; early leaves, lethal dose, 17 mg.; flowers, lethal dose, 21 mg.; late seeds, lethal dose, 28 mg.; early seeds, lethal dose, 32 mg.; and late pods are slightly toxic. While it has been reported that lupine alkaloids are easily soluble in water, repeated experiments were made with aqueous extracts and negative results as to toxicity.

A small quantity of poison was isolated from the woody aster for the first time.

A handbook on antiseptics, H. D. DAKIN and E. K. DUNHAM (New York: The Macmillan Co., 1917, pp. IX+122, pls. 2, figs. 2).—This is a small handbook prepared with a view to giving a concise account of the chief chemical antiseptics which have been found useful for surgical purposes during the present war.

Following a general introduction the subject is dealt with under the heads of antiseptics of the chlorin group, the phenolic group, salts of the heavy metals, dyes, and miscellaneous antiseptics, methods of testing antiseptics, and other special applications of antiseptics.

the common disinfectants, M. BOESER (*U. S. Dept. Agr., Farmers' Bul.* 345, 1918, pp. 12).—A revision of Farmers' Bulletin 345 (*E. S. R.*, 20, p. 883).
 Dakin's dichloramin-T solution for ocular infections, A. S. and L. D. (*Jour. Amer. Med. Assoc.*, 70 (1918), No. 17, pp. 1212, 1213).—The authors report the successful use of dichloramin T as a conjunctival antiseptic. It is used in solutions of from 0.5 to 1 per cent strength, instillations of 4 or 5 drops being made at four intervals. Cases are described showing satisfactory results obtained in hospital practice.

The action of antiseptics on the toxin of *Bacillus welchii*.—A preliminary report, H. D. TAYLOR and J. H. AUSTIN (*Jour. Exptl. Med.*, 27 (1918), No. 3, pp. 481; *abs. in Chem. Abs.*, 12 (1918), No. 9, p. 923).—The action of various antiseptics on the toxin of *B. welchii* as prepared by Bull and Pritchett (*S. R.*, 37, p. 781) was studied, using pigeons as indicators.

The results show that Dakin's hypochlorite and chloramin-T solutions will protect pigeons against multiple fatal doses of the toxin of *B. welchii* when the antiseptic and the toxin are mixed in vitro and allowed to stand in contact two minutes before injection. The detoxicating action of the solutions is inoperative also in the presence of serum. Phenol solution, 0.25 per cent, has such action.

The explanation of the difference in behavior of the two classes of antiseptics, that the one represented by phenol possesses little or no destructive action on the products of bacterial activity, while the chlorinated antiseptics attack not only the bacteria, but also their products and, by an alteration and disintegration of the molecules of the latter, render them inert.

Local reactions in the treatment of epizootic and ulcerous lymphangitis by chemotherapy, BELIN (*Bul. Soc. Cent. Méd. Vét.*, 94 (1918), No. 2-4, pp. 140).—The author discusses the preparation of anti-epizootic and anti-ulcerous vaccines by his method previously noted (*E. S. R.*, 38, p. 587) and that of G. H. S. R., 38, p. 587), and claims the superiority of his own method of a noninflamed ether as destroying more completely the microorganisms *Escherichia* and thus preventing local reactions. The use of the vaccine is suggested as a preventive as well as curative measure.

It is recommended that wounds which are in the least contaminated should be treated by a subcutaneous injection of 2 cc. of each vaccine, and in the case of a second wound in another part of the body an injection of 2 cc. of the epizootic vaccine alone. If the wounds have not healed at the end of a week a second injection is recommended.

The chemotherapy of experimental pneumococcus infection, J. A. KOLMER and E. STEINFIELD (*Jour. Infect. Diseases*, 22 (1918), No. 5, pp. 492-501).—The authors report investigations in the chemotherapy and the chemoserotherapy of experimental pneumococcus infections.

The ordinary soluble salts of mercury and numerous new mercurial compounds were found to be without appreciable effect in prolonging the lives of mice infected with a dose of Type I pneumococcus culture lethal within 72 hrs. Derivatives of quinin seem to be at present the most efficacious pneumococcal agents. Subcutaneous injection of ethylhydrocuprein hydrochlorid in mice without protective value usually increases the protective value of anti-pneumococcus serum to a slight extent. Several of the more common compounds of quinin, as quinin and urea hydrochlorid and quinin bromid, act in a similar but far less regularly and to a lesser extent. Mercurial compounds seem to have no effect on the protective power of the serum in severe experimental infections.

A study of an autoagglutinin occurring in a human serum, MILDREY, CLOUGH and INA M. RICHTER (*Bul. Johns Hopkins Hosp.*, 29 (1918), No. 3, pp. 86-93, pl. 1; *abs. in Jour. Amer. Med. Assoc.*, 70 (1918), No. 18, p. 1334). The autoagglutination observed occurred only at low temperatures (below 10°C.) and broke up at body temperature but could be reproduced by again adding the same preparation. The autoagglutinin resisted heating to 60° for 1 hour but was destroyed at 65°. It remained active in the ice box for several months. It was nondialyzable, not removed by extraction with chloroform, precipitated with the euglobulin by saturated ammonium sulphate solution and absorbed from the serum during the process of agglutination at low temperatures. It was active on red blood cells from all the different species of animals with which it was tested (man, rabbit, guinea pig, hen, sheep, cat, pig).

A comparison of rouleaux formation with autoagglutination showed that the former occurs equally well at high or low temperatures, but only in concentrated serum. The activity of the rouleaux-forming substance rapidly disappears on standing.

The authors consider that the presence of the autoagglutinin in the case studied was probably not a pathological phenomenon but an individual hereditary peculiarity.

A case of enteritis in man caused by the bacillus of fowl cholera, V. W. BOER (*Centbl. Bakt. [etc.], I. Abt., Orig.*, 79 (1917), p. 590; *abs. in Rev. Bact.*, 7 (1917), No. 4, p. 102).—A bacillus pathogenic for the rabbit and for hens and having all the morphological and cultural characteristics of *Bacillus septicus* was isolated from the feces of a case of enteritis which clinically resembled Asiatic cholera. The patient's serum gave specific agglutination and complement-fixation reactions with the bacillus.

A comparative study of infantile paralysis, animal distemper, and its related diseases, L. D. BRISTOL (*Jour. Med. Research*, 37 (1918), No. 4, p. 321-426).—In part 1 of this work the author attempts to show that there are certain rather suggestive epidemiological, pathological, and clinical characteristics common to distemper (and its related diseases of lower animals) and human infantile paralysis. In part 2 he endeavors to show by bacteriological and serological experiments that possibly the above analogies may be extended to include biological similarities in the infecting organisms concerned. The studies led him to suggest the possibilities that the organism of poliomyelitis is a pleomorphic bacillus (often indistinguishable from a true coccus) and that it may be closely related to the large group of so-called bipolar bacilli, or Pasteurella of Ligniers. It appears that all of these organisms, including that of poliomyelitis, have the power to adapt themselves somewhat to variable degrees of oxygen tension.

"The chief theoretical suggestion is that infantile paralysis may be nothing more than the manifestation of a common widespread human pasteurellosis; the nonparalytic (a better term than 'abortive') cases representing chiefly the digestive and respiratory types of the disease, while the paralytic cases may be included in the nervous type. Based on this assumption, the mode of spread may be considered analogous to that demonstrated for all forms of pasteurellosis in animals, namely, (1) directly, by contact with the fresh secretions or excretions of an infected individual (either diseased or a healthy 'carrier') (2) indirectly, by the carriage of the specific organisms by insects, or possibly in dust, uncooked food, or drink.

"Considering the epidemiology of the disease in this light, the great variation in virulence which is characteristic of the various bipolar bacilli must be kept in mind. Thus, bipolar bacilli causing disease in one animal are most virulent

of that particular species of animal, but (though somewhat less virulent) this one strain of organism may at times cause symptoms of similar disease in other species. Hence, we might believe that sporadic cases, small outbreaks, 'outbreak outcroppings' in epidemics of a human pasteurellosis have their origin in lower animal 'reservoirs'; but that severe, widespread epidemics, and the steadily increasing prevalence of the disease, are due more to the passage of a human strain of the organisms (of a steadily increasing virulence) directly or indirectly from person to person."

A list of 47 references to the literature is included.

Tuberculosis and blastomycosis. F. SANFELICE (*Ann. Ig. [Rome]*, 28 (1918), no. 2, pp. 49-56).—An examination is reported of the blastomycetes which are regularly found in the lungs of tuberculous cattle. No pathogenic obilia were found, but blastomycetes were found identical in morphological and cultural characteristics with *Saccharomyces neoformans*. This species, isolated from the lungs of tuberculous cattle, when inoculated from a pure culture into rabbits, guinea pigs, and white mice, is capable of causing death with diffuse pneumonia. Inoculated simultaneously with human or bovine tubercle bacilli, such is also caused with pathoanatomical findings of tuberculosis and diffuse pneumoniosis. There is a similar connection between the bacilli of avian tuberculosis and *S. neoformans*.

Hairlessness and goiter in newborn domestic animals. H. WELCH (*Montana (n. Pal.)* 119 (1917), pp. 81-104, figs. 9).—Occasional losses in Montana of piglets born without hair, extending over a period of some 15 or 20 years, due to the investigations here reported.

The results show that a disturbance of the function of the thyroid gland is the immediate cause of hairlessness in pigs, lambs, and calves, and of blindness in colts. The occurrence of hairlessness in pigs appears to be independent of any system of feed, care, or management as yet practiced, and is not due to infectious abortion. The enlarged thyroid glands were found to be very deficient in iodine, which has been demonstrated to be the essential element for the proper functioning of the gland and when supplied to the female breeding stock during gestation is apparently effective as a preventive of goiter in the newborn. The author feels justified in advocating the feeding of iodine (potassium iodide) to pregnant domestic animals in sections of the Northwest where goiter is prevalent. It is stated that this affection has been known for a number of years in sections of several Northwestern States, including Washington, Idaho, North Dakota, South Dakota, Minnesota, and Montana.

Thyroid hyperplasia and the relation of iodine to the hairless pig malady. E. R. HART and H. STEENBOCK (*Jour. Biol. Chem.*, 33 (1918), No. 2, pp. 15-33, pls. 2; *abs. in Chem. Abs.*, 12 (1918), No. 8, pp. 827, 828).—The authors support the view of Smith (*E. S. R.*, 37, p. 278) that the hairless pig malady is caused by low iodine assimilation which results in a goitrous condition in both mother and young and interferes more severely with fetal development than with the normal maintenance of the mother. Evidence is offered to show that the condition may be produced by rations with high protein levels and low laxative effects, accompanied by lack of exercise and unclean surroundings. By combining the same feeds in different proportions to furnish a lower protein content and good laxative properties, normal offspring have been obtained from the same sows.

The authors do not advocate the general use of iodine in the feed of all brood sows, but suggest that more attention should be paid to the proper combination of natural materials unfortified with potassium iodide. Wherever hairless pig production is endemic or persistent, iodides should, however, be used.

Contagious abortion in mares and cows, H. J. FREDERICK (*Utah Sta. Exp. 28 (1918), pp. 3-18, figs. 16*). This is a general summary of information regarding infectious abortion, which is prevalent among live stock in all parts of Utah.

Blackleg and its prevention, G. A. JOHNSON (*Jour. Amer. Vet. Med. Assoc., 53 (1918), No. 2, pp. 214-221*).—In this article are described the symptoms and post-mortem lesions of blackleg and the present methods of combating the disease, particularly by the use of germ-free blackleg vaccine and blackleg antiserum. It is stated that out of the several thousand cases treated with germ-free blackleg vaccine during the past year there has not been a single animal lost from blackleg later than eight days after vaccination, and only a small fraction of 1 per cent during the first eight days after vaccination.

The differentiation of the paratyphoid enteritidis group.—III. The uncommonness of *B. suis* in the intestines of normal swine, E. O. JOHNSON (*Jour. Infect. Diseases, 22 (1918), No. 3, pp. 252-257*).—Following a review of the findings of other investigators the author reports his own observations in confirmation of those previously noted (E. S. R., 38, p. 284), from which he has drawn the following conclusions:

"In all, 1,119 strains from the lower intestine of 291 normal swine have been tested. Only 40 of these have proved to be dextrose +, lactose —, and unable to liquefy gelatin. Using only the five tests (typical reaction milk, indol, salicin, sorbit, and rhamnose), 7 out of 40 tested gave the *suis* reaction in milk (including slow production of alkalinity as in the paratyphosis A type), 14 out of 40 did not produce indol, 22 out of 32 did not ferment salicin, 14 out of 32 fermented sorbit, and 11 out of 25 fermented rhamnose. In no instance were more than three of these five characters of the *suis* type united in one strain. Of the 26 strains closest to the true type, 9 differed in two of the three differential tests, 7 in three, and 9 in four. These strains have also been tested with paratyphoid B, *suis*, and enteritidis serums sufficiently potent to agglutinate the homologous organisms in 5,000; 10,000 dilution, but not one has ever shown more than a trace of agglutination in 1:100 dilution.

"It must be concluded, therefore, that the occurrence of true *suis* strains in any abundance in the intestines of normal swine in this country is a rarity. The alleged frequency of occurrence of these bacilli reported from some places in Europe may perhaps be due to the inclusion of a high proportion of hogs that had become permanent or temporary carriers through their association with infected animals. Perhaps in some instances, also, identification has been made on the basis of too few biologic and cultural characters. Some writers describe indol-producing strains as if they were to be differentiated hardly or not at all from typical members of the group. In the course of my examination in the past four years of some hundreds of typical and atypical *suis* and paratyphoid bacilli, I have never yet found an indol-producing bacillus that did not differ in some other cultural respect or that agglutinated to any degree showing a biologic relationship with the type organisms. The observations recorded in this paper suggest that the true *B. suis* is not a common inhabitant of the intestine of normal swine, and that its occurrence in these animals is to be looked upon as an expression of the 'carrier' condition."

Important points in determining the presence of hog cholera in the herd (Va. Dept. Agr. and Immigr. Bul. 126 (1918), pp. 90-102, figs. 6).—This article is a general discussion of the symptoms of hog cholera, the changes in body tissues noted on post-mortem examinations, and the treatment of the disease by the use of anthrax-cholera serum. Directions are given for obtaining and using the serum, and suggestions are offered regarding the prevention of the spread of the disease.

Some biological and control studies of *Gastrophilus hæmorrhoidalis* and other bots of horses, W. E. Dove (*U. S. Dept. Agr. Bul. 597 (1918), pp. 51, 52, figs. 1).*—This is a report of studies made of three species of horse bots occurring in the United States, each of which is a source of considerable injury to horses, namely, the common bot-fly (*Gastrophilus intestinalis* [Cq.]), the throat bot-fly (*G. nasalis*), and the nose fly (*G. hæmorrhoidalis*). The injury which they cause is produced through worryment at the time the eggs are laid and by the attachment of the larvæ in the alimentary tract.

G. intestinalis and *G. nasalis* are widely distributed in the United States, but *G. hæmorrhoidalis* is confined to the North Central and northern Rocky Mountain States. "The nose fly is by far the most annoying to horses at the time its eggs are laid. The adults appear early in June and reach the maximum abundance during the first half of the season, disappearing with killing frosts. The eggs are deposited on the minute hairs on the lips, and those near the corners which are kept moist and receive friction hatch in from 5 to 10 days. The larvæ are taken in with food or water and attach themselves to the walls of the stomach. Here they remain until the following winter or spring and then migrate to the rectum, where they reattach. Before leaving the host they usually attach close to the anus and protrude from it. They remain in this position from 40 to 71 hours.

"After dropping to the ground the bots seek protection and pupate from 18 to 170 hours later. The pupa stage lasts from 21 to 68 days. The adults are very active, and as they deposit only one egg at a time they are not so frequently seen on horses as are the adults of the common bot-fly. They take no food in the adult stage. Their length of life is from 1 to 7 days.

"The throat bot-fly deposits its eggs on the hairs under the jaws and to some extent on the shoulders and other parts of the host. The larvæ of this species attach themselves to the walls of the pharynx and also to those of the stomach and duodenum. They do not reattach in the rectum or at the anus, as do the bots of the nose fly. Pupation occurs in from 1.5 to 2 days after the larvæ have passed from the host, and adults emerge in from 20 to 56 days later. The adults are somewhat longer lived than those of the nose fly. The flies cause considerable annoyance to horses during oviposition, but not as serious as in the case of the nose fly.

"The common bot-fly usually appears later in the season than the nose fly and becomes most abundant just before killing frosts. The eggs are deposited on all parts of the body, but preferably on the fore legs. They hatch upon the application of moisture and friction. From 9 to 11 days after oviposition appears to be the most favorable period for hatching, although some may hatch as early as 7 days and others as late as 96 days after oviposition. The larvæ attach in any part of the stomach, but the last-stage bots are found mostly in the left sac. They continue to drop from the host for a long period of time. Pupation takes place in protected places on the surface of the soil, and the pupa stage lasts from 40 to 60 days."

"It is pointed out that all *Gastrophilus* larvæ are extremely resistant to chemicals. The treatment of horses with carbon disulphid in three doses followed by a physic is satisfactory if administered late in the fall, whereas spring treatment is less effective, as the full-grown larvæ are more resistant, and many of the nose-fly bots have left the stomach and passed back to the rectum at that time. Larvæ of *G. hæmorrhoidalis* may be removed from the rectum mechanically, but this is laborious. The use of enemæ containing insecticides is ineffective. As a repellent pine tar mixed with other material gave good results against the common bot-fly and the throat bot-fly.

"Various nose protectors are in use against *G. hemorrhoidalis*, but there are objections to many of them. A piece of leather suspended below the bit from the bit rings is said to be the simplest and best. For animals on pasture a halter with a box-like arrangement and throat cover has been devised to protect horses against infestation by all three species."

Kerosene oil used as a wash is ineffective in destroying the eggs of *Gastrophilus*, but certain other substances, including carbolic acid containing 2 per cent phenol, have given good results in destroying the eggs.

A bibliography of 38 titles is included.

Filariasis in native Hungarian horses. IV, D. WIRTH (*Ztschr. Infektionskrankh. u. Hyg. Haustiere*, 18 (1917), No. 4-5, pp. 389-413, pls. 4; abs. in *Verh. Vet. Bul.*, 5 (1917), No. 4, pp. 237-248, figs. 3).—This paper deals particularly with the morphology and biology of the microfilariae in the blood of Hungarian horses.

Fistula of the withers and poll-evil, L. A. MERRILLAT (*Chicago: Amer. Vet. Pub. Co.*, 1917, pp. 133, figs. 15).—This handbook deals with two prevalent diseases of the horse.

A contribution to the study of lymphangitis of the horse, HAAN and ARGER (*Rev. Gén. Méd. Vét.*, 26 (1917), No. 310, pp. 469-485).—A discussion of epizootic and ulcerous lymphangitis.

Acute hepatitis and nephritis of the hen, B. F. KATZ (*Jour. Amer. Vet. Med. Assoc.*, 51 (1917), No. 3, pp. 421-424, figs. 2).—This is a report of two cases of associated acute hepatitis and nephritis, which were studied at the North Carolina Experiment Station.

Spirochetes, II, NOGUCHI (*Jour. Lab. and Clin. Med.*, 2 (1917), Nos. 6, pp. 365-400, figs. 3; 7, pp. 472-499).—The first paper consists of a comprehensive review of the knowledge of these organisms, accompanied by a list of 120 references to the literature. The second deals with the transmission of spirochæta and treponema to man and animals and their filterability, cultivation, and immunity and immunization, and includes a list of 154 additional references to the literature.

International catalogue of scientific literature. B.—Bacteriology, QR.—Serum physiology (*Internat. Cat. Sci. Lit.*, 12 (1917), pp. VIII+309+III+24).—The schedules have been revised in accordance with the decisions of the International convention of 1905. The literature indexed is mainly that of 1912, but portions of the literature of 1901 to 1911 are included, also some entries dated 1913.

RURAL ECONOMICS.

The requisites of a national food policy, W. H. HAMILTON (*Jour. Pol. Econ.*, 26 (1918), No. 6, pp. 612-637).—This article includes a general discussion of the nature of the food problem, both in the United States and the allied and neutral countries of Europe, and the resultant burden placed upon the United States. It is stated that the basis underlying a food policy must be one of either direct or indirect diversion of economic resources to national purposes. The obligations imposed upon both the consumer and producer are discussed, and the conclusion is arrived at that the real solution of the problem calls for a positive policy on the part of the Government in supervising the proper distribution of food. Authoritative regulation must include price-fixing, but this can not succeed unless it is based on a complete understanding of the nature of the price system and the relation of particular prices to economic conduct.

Report of the [Porto Rico] food commission (*Rpt. Food Com. [P. R.] 1916*, pp. 191).—The commission discusses the methods used to alleviate the food shortage, stabilize prices, facilitate local distribution, and stimulate production.

Food situation in central Europe, 1917. A. MAYLANDER (*U. S. Dept. Labor, Labor Statis. Bul.* 242 (1917), pp. 128).—The information contained in this pamphlet was procured from files of leading daily newspapers of central European countries, particularly of Germany. The material covers the food situation in Germany, Austria, Hungary, Bulgaria, and Turkey during 1917, up to the end of October. For each country there is given a summary of the food situation, an outline of the food policy for the coming year, harvest results, food orders relating to individual foodstuffs, comments on and criticisms of these orders and their practical application, data on the supply and prices of individual foodstuffs and rations, war kitchens, profiteering, illegal procuring of food, food card systems, measures for the cheapening of food for the poorer classes, and the effect of the food shortage on the health of the civilian population.

Factors in the study of the cost of living in Portugal, 1914-1916 (*Lisbon: Mon. Financas, Bur. Statis. Agr.*, 1917, pp. 31).—In this report are given statistical data indicating the prices of important agricultural products by districts.

Economic situation in Indo-China, 1916 (*Bul. Econ. Indochine, n. ser.*, 29 (1917), No. 126, pp. 441-482).—This report discusses the extent of the agricultural product, import and export trade, and the damage done by the various types of animal diseases.

Forecasting the yield and the price of cotton, H. L. MOORE (*New York: The Macmillan Co.*, (1917), pp. VIII+173, figs. 13).—The author has outlined in considerable detail a method of forecasting the yield of cotton from the weather reports, and maintains that in 17 out of 20 cases the forecasts from the weather were more accurate than the forecasts from the condition of the crops by official methods.

[Market problems of interior Alaska], J. W. NEAL (*Alaska Stas. Rpt.* 1916, pp. 50, 51).—It is pointed out that the native potatoes have finally superseded the imported product, very few potatoes having been shipped into the region around Fairbanks in the past two years.

Attention is also called to the possibility of extending the production of timothy hay, poultry, and poultry products to meet local demands.

The cooperative movement in Russia: Its history, significance, and character. J. V. BUKHOFF (*Manchester, England: 1917, Coop. Printing Soc. Ltd.*, pp. 162, figs. 38, pt. 1).—This is stated to be the first attempt to give in the English language a connected systematic survey of the cooperative movement in Russia. The author explains conditions under which the Russian peasant was formerly obliged to work and the various attempts toward cooperation. The basis of the whole movement is explained to secure opportunity to purchase goods and sell the product of labor without the intervention of middlemen and to supply small credit at low rates.

Four principal phases of the Russian cooperative movement are outlined, represented by agricultural societies, consumers' societies, credit and loan saving societies, and cooperative unions. The agricultural societies (268 in 1901, 221 6000 in 1916) are educational organizations to provide lectures, exhibitions, libraries, etc. Fifty-nine per cent of the members of consumers' societies are peasants and 30 per cent are workmen. In 1914 there were 10,000 societies, with a membership of 1,530,000; in 1917 there were 20,000 societies. There are two types of credit associations for loans and savings and for small credit, with a membership of 10,000,000, and with the aim to put down the usurer. They purchase agricultural equipment, lease and build works, and advance security on crops. More than one-half their capital is raised by the societies themselves, without State assistance.

The credit is given the Zemstvos for publishing books, sending out lecturers, and aiding in the educational work known as "The People's Pairices."

Linking the movement in Russia with that in England and other countries, the author finishes with an explanation of the project for an International Cooperative Exchange.

Agricultural cooperation in Denmark (*Ill. Dept. Agr., Circ. 259* (1938), pp. 7).—This report points out the effect of agricultural cooperation in building up the wealth and intelligence of the rural communities.

The farmer, ALISSA FRANK (*In Use Your Government*, New York: E. P. Dutton & Co., 1918, pp. 1-149, pls. 13, figs. 9).—In these pages the author discusses some of the ways in which the Federal Government is aiding the farmer, especially through the various bureaus of the U. S. Department of Agriculture, Bureau of Education, Public Health Service, etc., and the financial assistance which the farmer may receive through the Federal Farm Loan Bureau.

Balancing country life (*New York: Association Press* (1917), pp. XIII+112 pls. 1).—This is a report of the country life conference held in Chicago on October 25, 1916, under the auspices of the International Committee of the Young Men's Christian Association, and participated in by workers from the organization itself and others interested in rural life problems. It discusses the relationship of the home, school, church, and community, to rural life.

The American Farm Management Association.—Record of the proceedings, 1916 (*Amer. Farm Management Assoc. Proc.*, 7 (1916), pp. 134, figs. 5).—These proceedings have been previously noted (*E. S. R.*, 36, p. 297).

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt.*, 4 (1918), No. 4, pp. 33-44, figs. 10).—This number contains the crop summary for March, 1918, data regarding the condition of farm animals April 1 and estimated losses during the year, estimated farm value of important products March 15 and April 1, average prices received by producers, and range of prices of agricultural products at important markets. It also gives special data with reference to the foreign trade of the United States in agricultural products, trend of prices, wages, and land values, cycle of live stock prices, edible bean production in 1917, the total number of sheep of specified breeds, the value of plowed land, beet sugar production for 1916 and 1917, etc.

Pasture land on farms in the United States, E. A. GOLDENWEISER and J. S. BALL (*U. S. Dept. Agr. Bul.* 626 (1918), pp. 83, figs. 7).—Data obtained from a tabulation of the agricultural schedules collected by the Bureau of the Census in 1910 are presented.

"Of the total farm land, which comprised about 879,000,000 acres in 1910, somewhat more than one-third was in crops, about one-third was in pasture, and somewhat less than one-third comprised all other kinds of farm land." A large part of the pasture land is unimproved, 99,000,000 acres being in wood land and 108,000,000 in other unimproved pasture. The improved pasture represents about 84,000,000 acres, or nearly one-tenth of the total land in farms.

[**Agriculture in the Commonwealth of Australia**], G. H. KNIBBS (*1916 Yearbook Aust.*, 10 (1901-1916), pp. 235-392, figs. 6).—These pages continue information previously noted (*E. S. R.*, 36, p. 93), by adding data for later years.

Modern Crete, L. FRANCHET (*Rev. Sci. [Paris]*, 56 (1918), No. 3, pp. 75-81).—The author describes the population and the agriculture, especially the products of the vineyards, cereals, olives, citrus fruits, tobacco, and coffee.

Annual report on reforms and progress in Chosen (Korea), 1915-16 (*Ann. Rpt. Reforms and Prog. Chosen (Korea)*, 1915-16, pp. X+161, pls. 199).—This report adds later information to that previously noted (*E. S. R.*, 36, p. 690).

AGRICULTURAL EDUCATION.

College teaching in agriculture, F. A. WARREN (*School and Soc.*, 7 (1918), No. 162, pp. 139-142).—The author calls attention to what he terms an obsession for subject matter to the exclusion of pedagogic technique, and the faulty organization of subjects into a curriculum in the college teaching of agriculture. He proposes five principles, formulated by half a dozen instructors studying these questions privately at the Massachusetts Agricultural College, by which to guide the student's work in the technical field.

These principles are stated as follows: (1) The establishment of a motive; the good primary motive being the expectation of self-support in a profession, to which later will be added professional pride and certain important altruistic impulses. (2) From this primary and general motive specific problems must be developed in the freshman and sophomore years, such problems, for example, as what kinds of fruit to grow, what soils to select, etc. (3) The materials of instruction must be chosen with a view to answering these questions, and thus immediately become technical material to be presented in technical courses.

In the author's opinion "the present assumption that botany, physics, etc., are 'indispensable' as 'foundation' subjects for pomology or landscape gardening is wholly untenable, and the retention of such subjects in a general required list is disastrous to the professional curriculum. The further popular assumption that such subjects give valuable 'general training' is both beside the point and without proof." (4) All the professional instruction must be coordinated about these questions, these in turn being coordinated about the primary motive. This coordination must be close and vital. It is found that while at present "the science courses are given professedly in the interest of the technical majors, only a very small quantity of the materials ever becomes available for practical application. The applications can be made efficiently only when and where the question arises: that is, in the technical department of market gardening or poultry husbandry. The answer must come from chemistry or bacteriology or meteorology, but it is utterly impossible for the chemist, bacteriologist, or meteorologist to make the application to the student's need." (5) In order to secure this effective coordination and also to eliminate the large amount of material which does not function in response to the foregoing principles, it becomes necessary for all of the professional work to be under the control of the particular technical department conducting the major. In place of formal science as now given in the science departments, the professional professor would take practical applied science in his major department.

College teaching in agriculture, R. A. DUREHAM (*School and Soc.*, 7 (1918), No. 162, pp. 353-356).—In this reply to the preceding article the scheme advanced is held to be untenable.

In the author's opinion "the very nature of agricultural courses is such that the men employed to manage the various divisions of the work must necessarily be experts in their knowledge of and their discoveries in their particular fields. Such men are necessarily the logical men to present such work in the college classroom. In such courses pedagogy will always take a back seat for subject matter, and only occasionally will be found the specialist who has the capability of developing the pedagogical phases of his specialty on a basis equal to his research ability." It is contended that the fundamental courses of a liberal cultural and scientific nature, which it is generally agreed should be offered during the first two years of every well-regulated college or university, will not only develop the student's ability to think straight and reason correctly, but will also help the student to appreciate and understand nature

and her methods, to become acquainted with laws and principles without which the more advanced courses could not be mastered efficiently, as well as to give the student a clearer idea as to electives.

The author thinks that "under Professor Waugh's system he would develop a narrow, practical viewpoint which is deplorably manifest in agricultural colleges even now. . . . If all students were to start taking horticultural courses, for example, in the freshman year and omit the science courses, where should we obtain our future specialists? . . . It would seem that the practical farmer and the student who wishes to go back to the farm should take the practical short courses which are designed especially for this type of student." If the curricula are crowded with useless courses the author suggests that some of the vocational courses, for which college credit is being given in many institutions, be first eliminated rather than the sciences which have made modern agriculture what it is.

Agricultural education: Organization and administration. L. S. HAWKINS. (*Fed. Bd. Vocational Ed. Bul. 13 (1918), pp. 42*).—This bulletin has been prepared to supply information and suggestions concerning the organization and administration of vocational agricultural education under the Smith-Hughes Act. It includes a brief review of the development of Federal legislation relating to agricultural instruction; statements of provisions to be made in State plans for meeting the requirements of the act; and studies and investigations to be undertaken by the Federal Board for Vocational Education, the Division of Agricultural Instruction of the U. S. Department of Agriculture, and the Bureau of Education. The text of the Smith-Hughes Act and statistical tables showing the prospective annual grants thereunder by the Federal Government are appended.

[Agricultural education and research in the Province of Quebec, 1916-17.] J. E. CARON. (*Rpt. Min. Agr. Prov. Quebec, 1917, pp. XII+227, pls. 391*).—This annual report of the Department of Agriculture of the Province of Quebec includes detailed information concerning the activities of the agricultural schools at Ste. Anne de la Pocatière, Oka Agricultural Institute, McDonald College, Montreal Veterinary School, St. Hyacinthe Dairy School, 53 household science schools, experiment stations, school gardens, and extension work under its control.

Agricultural teaching at the university (*Jour. Dept. Agr. Victoria, 17 (1917), No. 8, pp. 358-366*).—This is the report of a committee appointed by the Council of Agricultural Education of Victoria, Australia, to consider the success achieved in the university teaching of agriculture in Victoria and elsewhere, whether a single degree course in agriculture in Melbourne University should be continued or replaced by specialized science courses, and the type of training that would best qualify students to become expert officers of agricultural departments.

The committee finds that the attendance of the school of agriculture at Melbourne has not been as large in recent years as might have been expected mainly on account of the want of remunerative openings for graduates at the completion of their course. The present course has not succeeded in training farmers, although it was not designed for this purpose, as the agricultural colleges provide special facilities for such training. The principal objective of the course at the university should be to train agricultural scientists who will become instructors, administrators, or research workers. A lack of touch is also found between the university and the man on the land, which it is suggested could be overcome by the appointment of officers of the agricultural department as part time lecturers in subjects in which it is most desirable that the lecturers should be in close touch with their practical application to the

industry. It is found that the single degree course has lacked the special character and thoroughness necessary to the full realization of its aims, due almost solely to the want of financial means for equipment, etc.

The committee recommends the continuance of the general course in agricultural science with adequate provision for teaching it, and the addition of the following subjects to the curriculum: Agricultural zoology and botany, animal physiology, veterinary science and stock breeding, dairying, agriculture, entomology, plant pathology, and the principles of horticulture and of viticulture. The course should be extended from three to four years, and the second year, including practical farm work extending over four full days a week during the year, carried out at the Werribee State Research Farm instead of the Dookie College as heretofore; a special building should be erected for agricultural purposes; and the Government should undertake to appoint annually for the next five years at least six graduates in the departments of agriculture and education and the State Rivers and Water Supply Commission.

Essentials in the training of teachers of vocational home economics, ANNA E. RICHARDSON (*Ala. Girls Tech. Inst. Bul., n. ser., No. 44 (1918), pp. 10-20*).—The author outlines in a general way the content of a course in vocational home economics based on an analysis of the functions of the women in the house, and discusses the essential factors of the training of teachers for vocational home economics. These factors are summarized as follows: A recognition of the fact that vocational education is a new type of education and that its guiding principles are not the same as those of general education; vocational home economics courses based upon the needs of the housewife gained through the analysis of the work of the home maker; sufficient experience as a home maker to have first-hand knowledge of the problems and a sympathetic appreciation of the opportunities and difficulties of home making; and a course of study made up of vocational, related, nonvocational, and professional education courses so balanced that the students develop skill, through training and practice, a fundamental understanding of the processes involved in the vocation of home making, enlarged social and civic capacity, and a power to translate their education in terms which will fit the life and needs of their future students.

Marketing and housework manual, S. AGNES DOUTHAM (*Boston: Little, Brown, & Co., 1917, pp. [6]+241, pls. 4, figs. 3*).—Part 1 of this manual deals with general rules for marketing, marketing charts to assist the student or housewife in the choice, purchase, and care of food-stuffs, menu making, menu border sheets, the selection of foods, and a food inventory. Part 2 is devoted to housework rules and directions. The manual is stated to be the result of 20 years' study and experience in teaching.

Food problems, A. N. FARMER and JANET R. HUNTINGTON (*Boston and Lancaster: Ginn & Co., 1918, pp. XXII+90, figs. 51*).—The author states that the purpose of these problems is not to teach arithmetic, but to use arithmetic to teach understanding, necessity, and practice of food conservation. Suggestive discussions which aim to illustrate what should be done with each problem are included. Useful information relating to food conservation and a list of free bulletins are appended.

The preparation and the preservation of vegetables, HENRIETTA W. CALVIN and CAROL A. LYFORD (*U. S. Bur. Ed. Bul. 47 (1917), pp. 24*).—The authors fully discuss the value of vegetables in the diet and give directions for cooking and preserving vegetables.

MISCELLANEOUS.

Report of Alaska Stations, 1916 (*Alaska Sta. Rpt. 1916, pp. 91, pls. 13*).—This contains the organization list and a report of the several lines of work carried on during the fiscal year ended June 30, 1916. Meteorological data and accounts of the extensive tests with field and garden crops, live-stock operations, and other lines of work are abstracted elsewhere in this issue.

Annual report of the director for the fiscal year ending June 30, 1917 (*Debarare Sta. Bul. 119 (1918), pp. 28*).—This contains the organization list and the report of the director on the work and publications of the station including a financial statement for the fiscal year ended June 30, 1917. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Abstracts of papers not included in bulletins, finances, meteorology, index (*Maine Sta. Bul. 268 (1917), pp. 295-323+XVI*).—This contains the organization list of the station; abstracts of 10 papers previously noted, and abstracts of 6 papers noted elsewhere in this issue; meteorological observations noted on page —; a financial statement for the fiscal year ended June 30, 1917; an index to Bulletins 258-268, inclusive, which collectively constitute the thirty-third report of the station; and announcements as to the work, publications and equipment of the station.

Annual Report of Nevada Station, 1917 (*Nevada Sta. Rpt. 1917, pp. 32, figs. 10*).—This contains the organization list, a report of the director on the work of the station, departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue, a list of the publications of the year, and a financial statement for the fiscal year ended June 30, 1917.

Thirtieth Annual Report of New York Cornell Station, 1917 (*New York Cornell Sta. Rpt. 1917, pp. XC+1203, pls. 44, figs. 323*).—This contains the organization list, reports of the director of the station and heads of departments, and reprints of Bulletin 321 revised, noted on page 167, and of Bulletins 283 revised, and 378-391, and Memoirs 9-11, all of which have been previously noted, and a financial statement for the fiscal year ended June 30, 1917.

Report of West Virginia Station, 1915 and 1916 (*West Virginia Sta. Rpt. 1915-16, pp. 51*).—This contains the organization list; a report of the director on the work, publications, and needs of the station; and departmental reports of the experimental work in which is for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report of Wyoming Station, 1917 (*Wyoming Sta. Rpt. 1917, pp. 125-180, fig. 1*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1917, reports of the director and heads of departments, meteorological observations, and several special articles. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 1, pp. 16*).—This contains brief articles on the following subjects: Bovine Tuberculosis in Washington, by R. J. Donohue; Feeding the Dairy Calf, by A. B. Nystrom (see p. 182); Concerning the Organization of Drainage Districts, by F. W. Rader; Adjustments of Disputes between Buyers and Sellers of Farm Produce, by A. Hobson; Proven Farm Practices, by E. B. Stookey; Home-grown Feed for Poultry, by G. R. Shoup; and Poultry Notes, by Mrs. G. R. Shoup.

NOTES.

Arkansas Station.—H. R. Rosen, assistant botanist in the Indiana Station, has been appointed assistant plant pathologist. Dr. Woodruff has been appointed assistant veterinarian.

California University.—A new calendar has been adopted for the university, in order to assist in supplying farm labor during the harvest period. Instruction will be begun October 1 instead of in the third week of August as formerly. The new university budget appropriates about \$10,000 for additional instruction for the college of agriculture in connection with the war work of the institution. The new positions authorized include a professor of pomology, poultry and soils specialists for extension work, an additional instructor at Davis, and senior assistant librarian.

A short course for machine milkers has been held at Davis.

It is announced that California Gretel, a pure-bred Toggenburg goat at Davis, has broken the world's record for milk production by goats. In 365 consecutive days this animal produced 2,941.5 lbs. of milk containing 97.41 lbs. of milk fat, his milk production was equivalent to 24.5 times her body weight.

Minnesota University and Station.—A. H. Benton, assistant professor of farm management, resigned August 1 to become head of the department of rural economics and farm management of the Manitoba Agricultural College. E. B. Crossard, who is on leave of absence from the Utah College, has been appointed instructor in farm management beginning August 1.

Theodore E. Odland, instructor in agronomy and agronomist at Morris, A. C. Leine, instructor in farm engineering at Morris, and H. J. Beaumont, assistant in fruit-breeding research, are now in military service. Roy O. Bridgeford has been appointed instructor in agronomy and agronomist at Morris, and F. W. McGinnis, instructor in farm crops, beginning September 1. E. H. Stehmetz has been appointed assistant professor of farm crops and assistant agronomist of the station beginning July 1. August Haedecke has been appointed assistant in agronomy in the station, vice A. S. Merrill resigned to engage in commercial work. Miss Cornelia Kennedy, instructor in agricultural biochemistry and assistant biochemist, has been granted a year's leave of absence. Miss Josephine F. Berry has resigned as chief of the division of home economics, effective August 1, in order to continue as assistant director of home economics of the Federal Board for Vocational Education, and has been succeeded by Miss Mildred Kelzley, who has been acting chief of the division. Miss Nola Treat has been appointed manager of dining halls and assistant professor of institutional management, and Miss Lenore Richards, assistant manager and instructor in institutional management.

Missouri University and Station.—The establishment of three new soil experiment fields is authorized, one on the Bates silt loam in southwest Missouri, one on the Union silt loam south of the Missouri river, and one on the Lebanon silt loam in the central Ozark region.

L. F. Childers, associate professor of soils in the extension service, resigned May 1; W. L. Nelson, assistant in agricultural extension, May 15; I. F. Nuckols,

assistant in animal husbandry, June 1; and M. N. Beeler as agricultural expert, July 15. H. F. Robinson, foreman of the poultry plant, resigned June 1; was succeeded by J. W. Perry. A. J. Durant, research assistant in veterinary science, has been granted leave of absence for military service, beginning May 1.

Recent appointments include Miss Helen Jehann as research assistant in pathology, beginning July 1; Samuel Bryan Shirkey as assistant in agricultural chemistry, beginning June 15, and Wm. DeYoung as assistant in the soil survey, beginning June 1.

New Mexico College and Station.—Large and well equipped barns for dairy and beef cattle have been completed and horse, pig, and sheep barns are under construction. Important improvements are also being made in the live stock.

An extensive underground irrigation distribution system has been installed on the college campus. This system will furnish water for ornamental trees and shrubs and some of the experimental plots.

F. C. Werkenhuth, assistant professor of biology and assistant biologist, has resigned to accept a position as botanist at the New Hampshire College.

North Carolina College and Station.—Dan T. Gray, chief of the animal industry division, has been appointed specialist in animal husbandry in the U. S. Department of Agriculture for cooperative work between the States Relations Service and the Bureau of Animal Industry.

Pennsylvania College and Station.—Fred S. Hultz, assistant in animal husbandry, has been granted leave of absence to engage in Y. M. C. A. work in France. C. H. Hadley, jr., and L. S. Kleinschmidt have been advanced from instructors to assistant professors of economic entomology and poultry husbandry, respectively.

Pennsylvania Institute of Animal Nutrition.—J. E. Isenberg and M. C. Lewis have resigned as assistants in animal nutrition.

Porto Rico Insular Station.—I. A. Colón has been appointed first assistant chemist in chemical engineering.

South Dakota College and Station.—Dr. N. E. Hansen has recently received the George Robert White gold medal of honor awarded him in 1917 by the Massachusetts Horticultural Society "for eminent service in horticulture."

Robert Wylie has been appointed assistant professor of dairy husbandry, vice C. Larsen whose resignation has been previously noted.

Utah College.—John T. Caine, 3d, director of agricultural extension, has been appointed specialist in animal husbandry in the U. S. Department of Agriculture for cooperative work between the States Relations Service and the Bureau of Animal Industry.

Vermont University.—A unit of nine students has been enrolled in the National Woman's Land Army of America for farm work near Brattleboro from May 6 to September 15. Gardening, poultry raising, care of orchards, and harvesting are among the lines of work being undertaken.

Wyoming University. Dr. Aven Nelson, acting president during the past year, has been appointed president.

American Association of Agricultural Legislation.—This association effected a tentative organization at Philadelphia, December 28, 1917, and a permanent organization at Chicago, May 10-11, 1918. Its activities thus far have dealt particularly with marketing problems. Resolutions have been adopted endorsing the principles of collective bargaining by producer and consumer in the sale and purchase of farm crops and of the collective purchase of supplies by groups of farmers, and advocating legislation to safeguard these practices. Other resolutions have dealt with the pricing of wheat and the buying and storing of food products.

The officers consist of Elwood Mead of the University of California, president; Dr. Geo. F. Warren of Cornell University, vice president; Dr. Richard T. Ely of the University of Wisconsin, secretary; and Dr. H. C. Taylor of the University of Wisconsin, treasurer.

American Association of Agricultural College Editors.—This association held its sixth annual conference at the University of Tennessee, June 20-22, with representatives of 20 States in attendance. The first day's program consisted of a study of topics bearing upon correspondence courses in agriculture. The remaining days were given over to a discussion of printed forms of agricultural and farmstead work. Special attention was devoted to war time informational matters, including an address by Edwy B. Reid, chief of the Division of Publications of the U. S. Department of Agriculture, on the publications of this Department.

Officers for the following year were elected as follows: President, Bristow Adams of Cornell University; vice president, M. G. Osborn of Louisiana State University; secretary-treasurer, Frank C. Deam of Ohio State University; and additional members of the executive committee, Harry B. Potter of the University of Tennessee and Frank H. Jeter of the North Carolina College.

Horticultural Station in Brazil.—The experiment station at Deodoro, Brazil, has been converted into a horticultural station to serve as a model for farms of the region, as a practice school for students, and as a nursery for the production of fruit trees for free distribution. Experimental work will include the improvement of domestic fruit trees and introduction and acclimatization work, cultural studies, the combating of insect pests, studies of methods of transporting plants and packing fruits, and fruit utilization and marketing. Apprenticeships will be provided for boys from 14 to 15 years of age for instruction in pomology. Some attention will also be given to vegetable growing and the provision of instruction in improved methods of plowing, etc. A staff consisting of a director and four assistants is to be provided.

Age Limit of Agricultural College Students in Canada.—On account of the depletion of enrollment due to the war the age limit of admission to the School of Agriculture of Ste. Anne de la Pocatière has been reduced for the duration of the war to 14 years, and that at the Oka Agricultural Institute to 15 years for the regular course and 14 for the 2-year practical course. A special class of 50 junior students of from 14 to 15 years of age is to be opened at the Manitoba Agricultural College for either the regular first year work or the selection of special subjects.

Degree Course in Household Science in Quebec.—The work for the new degree of Bachelor of Household Science in the Province of Quebec will consist of the work of the first two years of the B. A. or B. S. courses in the faculty of arts in McGill University, and the work of the third and fourth years at Macdonald College. It will include English and economics, the same as that given to the third and fourth year students in the faculty of agriculture; the science subjects, such as chemistry, physics, biology, and bacteriology, partly taken in the school of agriculture and partly in the school of household science; and the technical subjects—foods, textiles, clothing, the home, and the distribution—which will be given entirely by the school of household science. The course represents two-fourths academic work, one-fourth scientific, and one-fourth technical—a proportion very similar to that given for the B. A. degree in household science at Toronto University and somewhat similar to that given in a large number of institutions in this country, such as Chicago, Columbia, Wisconsin, and Cornell universities where similar courses have been in operation for over 10 years.

Necrology.—Dr. Alexander Francois Liantard, founder of the first veterinary medical school in this country and one of the founders of the U. S. Veterinary Medical Association, as previously noted (E. S. R., 29, p. 301), died at his home in France, April 20, age 84 years. Dr. Liantard was for many years editor of the *American Veterinary Review*, and throughout his life intensely interested in veterinary education. He was the author of a long list of standard text books for the veterinary profession. In 1884 he received the decoration of Chevalier du Merite Agricole from the French Government.

Maurice de Vilmorin, member of Vilmorin-Andrieux & Company of Paris, France, died April 21 at the age of 69 years. He was a well known horticulturist and dendrologist, and his collection of shrubs growing at Les Barres was perhaps the most comprehensive in Europe.

Frank N. Meyer, agricultural explorer for the U. S. Department of Agriculture in China, Siberia, and Turkestan for nearly ten years, has died in China. He was the introducer of hundreds of species and varieties of plants from these regions, many of great economic value. Among his most recent discoveries was the location of the original home of the chestnut bark disease.

The death in France from wounds is reported of Lieut. E. J. Woodhouse of the British Army. Lieut. Woodhouse was appointed economic botanist to the Government of Bengal in 1908 and in 1911, principal of the Agricultural College of Bihar and Orissa. He had worked on several problems in economic botany and entomology, including the potato moth.

Lieut. Vernon King, scientific assistant in cereal and forage crop investigations in the Bureau of Entomology of the U. S. Department of Agriculture, has died from wounds received in the aviation service of Great Britain.

The recent death is noted of K. Toyama, professor of zoology in the Imperial University of Tokio. He was a graduate of the College of Agriculture of the university in 1892 and had worked mainly on the breeding of silk worms.

New Journals.—*Public Roads* is being issued monthly by the Office of Public Roads and Canal Engineering of the U. S. Department of Agriculture. It is the intention to present matters of special interest to those concerned with the construction and maintenance of roads and to supplement the bulletins of the Office by the prompt publication of the results of its experiments and other phases of its work. The initial number contains a complete record of the status of each State project submitted under the Federal Aid Road Act up to February 28, 1918, and it is expected to present a corrected list monthly. Various short articles are included, as well as a brief summary of forthcoming publications of the office.

Annals of the Phytopathological Society of Japan is being published by that society. The initial number contains several articles printed in English or German, as well as Japanese; a brief historical sketch in English by M. Shiro, professor of phytopathology of the Agricultural College of the Imperial University of Tokio, on the development of phytopathology in Japan, and a considerable number of abstracts in Japanese of phytopathological articles.

The Potato Magazine is being published by the Potato Association of America. The initial number contains several articles by agricultural college and Federal officials on various phases of the potato industry.

